OCCUPATIONAL ANALYSES SERIES

Welder

2004

Human Resources and Skills Development Canada
Ressources humaines et Développement des compétences Canada

Canada

LM-431-07-04E

105-00188/

Occupational Analyses Series

Welder

2004

Trades and Apprenticeship Division

Human Resources
Partnerships Directorate

Disponible en français sous le titre :

Division des métiers et de l'apprentissage

Direction des partenariats
en ressources humaines

Soudeur/soudeuse

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Cat No. HS3-3/28-2004E
ISBN: 0-662-37782-6

The Canadian Council of Directors of Apprenticeship (CCDA) recognizes this occupational analysis as the national standard for the occupation of welder.

ACKNOWLEDGEMENTS

Human Resources and Skills Development Canada (HRSDC) wishes to express sincere appreciation for the contribution of the many industrial establishments, professional associations, labour organizations, tradespersons, provincial and territorial government departments and agencies, and to all others who contributed, directly or indirectly, to this publication.

Special acknowledgement is extended to Aline M. McRory of Alpha Millenium International (AMI), Mohamed Ally and Jody P. McRory who together developed the analysis with the following representatives from the industry:

Alan Acorn	Prince Edward Island
Jim Carter	Yukon
Art Chiasson	New Brunswick
Gordon Craig	International Brotherhood of Boilermakers
Ray Desveaux	Joint Apprenticeship and Training Committee of New Brunswick Inc.
Réjean Du Cap	Quebec
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This analysis was prepared by the Human Resources Partnerships Directorate of HRSDC. The planning, coordination and processing of the analysis were undertaken by staff members of the Trades and Apprenticeship Division of HRSDC.

OTHER RELATED OCCUPATIONAL TITLES

This analysis covers tasks performed by a welder whose occupational title has been identified by some provinces and territories of Canada under the following names:

- Industrial Welder
- Welding

LIST OF PUBLISHED OCCUPATIONAL ANALYSES *

TITLE	NOC** Code
Appliance Service Technician (1997)	7332
Aquaculture Technician (1977)	2221
Arts Administrator (1989)	0114
Automotive Painter (1995)	7322
Automotive Service Technician (1998)	7321
Automotive Technician - Automatic Transmission (1990)	7321
Automotive Technician - Electrical/Electronics (1992)	7321
Automotive Technician - Engine Repair and Fuel Systems (1989)	7321
Automotive Technician - Front-End (1989)	7321
Automotive Technician - Manual Transmission, Driveline and Brakes (1990)	7321
Aviation Machinist (1994)	7231
Baker (1997)	6252
Blaster (Surface) (1987)	7372
Boilermaker (2003)	7262
Bricklayer (2000)	7281
Cabinetmaker (2000)	7272
Carpenter (1998)	7271
Cement Finisher (1995)	7282
Construction Electrician (2003)	7241
Cook (2003)	6242
Electrical Rewind Mechanic (1999)	7333
Electronics Technician (Consumer Products) (1997)	2242
Electronics Technician Vol. I (1986) (Video Equipment)	2242
Electronics Technician Vol. II (1986) (Audio Equipment)	2242

* **Red Seal analyses are indicated in bold**

** **National Occupational Classification**

Electronics Technician Vol. III (1986) (Computer Equipment)	2242
Electronics Technician Vol. IV (1986) (Office Equipment)	2242
Electronics Technician Vol. VI (1986) (Communication Equipment)	2242
Electronics Technician Vol. VII (1986) (Signalling Equipment)	2242
Electronics Technician Vol. VIII (1986) (Navigation Equipment)	2242
Electronics Technician Vol. IX (1986) (Video Game Equipment)	2242
Electronics Technician Vol. X (1987) (CADD Equipment)	2242
Electronics Technician Vol. XI (1987) (CAM Equipment)	2242
Electronics Technician Vol. XII (1987) (Robotics Equipment)	2242
Electronics Technician Vol. XIII (1987) (Biomedical and Laboratory Equipment)	2242
Electronics Technician Vol. XIV (1987) (Industrial Process-Control Equipment)	2243
Farm Equipment Mechanic (2000)	7312
Floorcovering Installer (1997)	7295
Glazier (2004)	7292
Hairstylist (1997)	6271
Heating (Gas and Oil) Servicer - Commercial and Industrial (1978)	7331
Heavy Duty Equipment Mechanic (1998)	7312
Industrial Electrician (2003)	7242
Industrial Instrument Mechanic (2000)	2243
Industrial Mechanic (Millwright) (1999)	7311
Insulator (Heat and Frost) (2000)	7293
Ironworker (Generalist) (1993)	7264
Lather (Interior Systems Mechanic) (2002)	7284
Logistics (1992)	0713

Machinist (1998)	7231
Major Electrical Appliance Repairer (1984)	7332
Metal Fabricator (Fitter) (2003)	7263
Mobile Crane Operator (1997)	7371
Motorcycle Mechanic (1995)	7334
Motor Vehicle Body Repairer (Metal and Paint) (1997)	7322
New Home Builder and Residential Renovation Contractor (1992)	0712
Oil Burner Mechanic (1997)	7331
Painter and Decorator (2000)	7294
Partsperson (1995)	1472
Plumber (2003)	7251
Power Engineer (1997)	7351
Powerline Technician (2004)	7244
Recreation Vehicle Mechanic (2000)	7383
Refrigeration and Air Conditioning Mechanic (1997)	7313
Roofer (1997)	7291
Sheet Metal Worker (1997)	7261
Sprinkler System Installer (2003)	7252
Steamfitter-Pipefitter (1996)	7252
Tilesetter (2004)	7283
Tool and Die Maker (1997)	7232
Truck-Trailer Repairer (1994)	7321
Truck and Transport Mechanic (2000)	7321
Welder (2004)	7265

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FOREWORD

The first National Conference on Apprenticeship in Trades and Industries, held in Ottawa in 1952, recommended that the federal government be requested to co-operate with provincial apprenticeship committees and officials in preparing analyses of a number of skilled occupations. To this end, Human Resources and Skills Development Canada sponsors a program, under the guidance of the Canadian Council of Directors of Apprenticeship (CCDA), to develop a series of occupational analyses.

The Occupational Analysis Program has the following objectives:

- to identify and group the tasks performed by skilled workers in particular occupations;
- to identify those tasks that are performed by skilled workers in every province and territory;
- to develop instruments for use in the preparation of interprovincial standards "Red Seal" examinations and curricula for training leading to the certification of skilled workers;
- to facilitate the mobility, in Canada, of trainees and skilled workers; and
- to supply employers and employees, and their associations, industries, training institutions and governments with analyses of the tasks performed in particular occupations.

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GUIDE TO ANALYSIS

DEVELOPMENT OF ANALYSIS

A draft analysis is developed by a knowledgeable consultant who, with the assistance of a committee of industry experts in the field, identifies all the tasks performed in the occupation.

The draft is then assigned to occupational analysts at Human Resources and Skills Development Canada for translation and then returned to the consultant for review to ensure conformity with the nationally approved format.

The consultant will then forward a copy of this analysis to provincial/territorial authorities for validation by specialists in the field. Their recommendations are assessed and incorporated into the final draft that also includes the identification of the common core tasks performed in the occupation.

The occupational analysis is published in both official languages.

STRUCTURE OF ANALYSIS

To facilitate understanding of the nature of the occupation, the work performed is divided into the following divisions:

A. **BLOCK** – is the largest division within the analysis and reflects a distinct operation relevant to the occupation.

B. **TASK** – is the distinct activity that, combined with others, makes up the logical and necessary steps the worker is required to perform to complete a specific assignment within a "BLOCK".

C. **SUB-TASK** – is the smallest division into which it is practical to subdivide any work activity and, combined with others, fully describes all duties constituting a "TASK".

Supporting Knowledge & Abilities

The element of skill and knowledge that an individual must acquire to adequately perform the task is identified under this heading.

Trends

Any shifts or changes in technology that may affect the block are identified under this heading.

Related Components

All components of a specified task being undertaken by the welder are identified under this heading.

Tools and Equipment

All tools and equipment necessary for the welder to complete a task are identified under this heading.

VALIDATION METHOD

At the request of the Canadian Council of Directors of Apprenticeship (CCDA), the Standardization Sub-Committee developed a method for the validation of the national Red Seal occupational analyses.

A draft of the analysis is sent to all provinces/territories for validation. Each jurisdiction rates the sub-tasks and applies percentage ratings to blocks and tasks. This method for the validation of the national occupational analysis identifies common core tasks across Canada for a specific occupation. This feature facilitates the weighting of the Interprovincial Red Seal examinations.

DEFINITIONS

YES: the sub-task is performed by workers in the occupation in a specific jurisdiction.

NO: the sub-task is not performed by workers in the occupation in a specific jurisdiction.

BLOCK %: the average number of questions (items), derived from the collective decision made by workers within the occupation from all areas of Canada, which will be placed on an Interprovincial examination to assess each block of the analysis.

TASK %: the average number of questions (items), derived from the collective decision made by workers within the occupation from all areas of Canada, which will be placed on an Interprovincial examination to assess each task of the analysis.

NV: Not Validated by a province/territory.

ND: Not Designated in a province/territory.

PROVINCIAL/TERRITORIAL ABBREVIATIONS

NL:	Newfoundland and Labrador
NS:	Nova Scotia
PE:	Prince Edward Island
NB:	New Brunswick
QC:	Quebec
ON:	Ontario
MB:	Manitoba
SK:	Saskatchewan
AB:	Alberta
BC:	British Columbia
NT:	Northwest Territories
YK:	Yukon
NU:	Nunavut

COMMON CORE

The criteria for determining common core depend on the performance of sub-tasks. If 70% of the responding jurisdictions (excluding NVs and NDs) perform the sub-task, it shall be considered common core.

Interprovincial Red Seal examinations are based on the common core identified through this validation process. This process identifies what will be assessed through the interprovincial examination.

BLOCKS AND TASKS WEIGHTING (APPENDIX "C")

This appendix represents the block and task percentages as submitted by each jurisdiction.

Each jurisdiction, with the use of a provincial/territorial occupational advisory committee, validates the content, places percentages on blocks and tasks, and indicates whether or not the sub-tasks are performed by the skilled workers within the occupation. The results of this exercise are submitted to the consultant who then analyses the data and develops this appendix that provides the individual jurisdictional validation results as well as the national averages for all responses.

PIE CHART (APPENDIX "D")

The graph depicts the national percentages assigned to blocks in the analysis.

SCOPE OF THE WELDER OCCUPATION

This occupational analysis identifies tasks performed by qualified welders across Canada. A welder is a tradesperson who uses a wide variety of occupational knowledge, skills and abilities in combination with cutting, gouging and welding processes to tack and weld assemblies and fabrications within a quality control system.

The welder must be able to work on new construction or perform repairs. All work must be recorded accurately. This is due to the fact that the work of the welder is frequently in areas of construction where faults or defects could be hazardous to life and costly. This critical aspect of the welder's work can be, in part, attributed to the variety of equipment types and designs available from a wide range of manufacturers.

The welder's work is usually, but not exclusively, found in industrial and commercial sectors such as assembly plants, factories, shipbuilding, refineries and building construction. Welders may work on the same site for prolonged periods and may routinely perform a variety of tasks including vehicle and implement repairs or construction, oilfield fabrication and repairs and heavy equipment servicing and maintenance. They may also specialize in areas such as underwater welding and welding of non-metal materials.

Welders often perform their jobs in conditions that present physical discomfort and danger such as hazardous fumes, working at heights, in hot, cold, humid weather conditions and in cramped, dark areas. To perform their work the welders rely on their knowledge of metallurgy and the effectiveness of the equipment being used; their knowledge of codes, regulations, and laws; their experience in a wide variety of work situations and requirements; their ability to operate hand and power tools; and, their ability to determine the most appropriate means of proceeding with the work. Welders must also rely on some important attributes: their mechanical and mathematical aptitudes, above-average physical condition, eye-hand coordination and dexterity and their ability to plan and think sequentially as well as three-dimensionally.

Welders are routinely required to work closely with other tradespeople, including steel fabricators, steamfitters-pipefitters, boilermakers, carpenters, ironworkers, industrial mechanics (millwrights), electricians, machinists, sheet metal workers and mechanics. It is therefore important that the welder have some knowledge of, and familiarity with, the scope of work of these trades. In some cases, the work of the welder may overlap with that of these trades.

OCCUPATIONAL OBSERVATIONS

Some overlap exists between trade tasks performed by welders and other tradespersons. Insofar as this analysis is concerned, an attempt has been made to include tasks done by welders anywhere in Canada, regardless of overlaps and/or jurisdictional restrictions.

Technology continues to contribute to many changes in equipment design and construction. Of note are the following: lighter and more portable welding equipment; increased use of automatic-feed equipment; equipment with higher deposition rates than previously; and increased safety due to more sophisticated equipment. These innovations require constantly-changing methods and techniques governed by appropriate attitudes towards the current high standards for fabrication, installation and repair. Keeping abreast of these changes presents a daily challenge to members of this trade.

Today's equipment may be outfitted with a range of technologically sophisticated features and systems, frequently computerized, that tend to make the work of the welder physically less stressful and more precise. Most of these systems are accessible to the average welder, while others require highly specialized skills, training and equipment. As equipment becomes more technically complex, accompanying manuals and charts tend to be very specific in terms of factors critical not only to the job at hand, but also to the long-term operation of the system.

This report would not be complete without mention of the fact that the work of a welder, by its nature, continues to be somewhat hazardous. Errors in judgement or in practical application of trade knowledge can be costly, both in terms of injury to workers and damage to equipment or materials. Breathing apparatus and fume extraction equipment requirements due to hazardous fumes are becoming an integral part of all worksites and places of employment. Constant and vigilant attention to the application of safety and accident prevention knowledge must be maintained by workers at all times.

Welders are more than ever being called on to document and maintain records due to more stringent laws and regulations. The welder's products in industrial and other applications, must be appropriately installed, inspected and documented. This places more responsibility on supervisors, quality control personnel, and on the individuals who perform the shaping and assembly of components. The tremendous variety in equipment and methods means that the welder must be more knowledgeable and adaptable than ever before. Coupled with this is the trend of increased and appropriate communication with the public and fellow employees, which seems to be of great importance to the welder in today's workplace.

SAFETY

Safe working procedures and conditions, accident prevention, and the preservation of health are of primary importance to industry in Canada. These responsibilities are shared and require the joint efforts of government, employers, and employees. It is imperative that all parties become aware of circumstances that may lead to injury or harm. Safe learning experiences and environments can be created by controlling the variables and behaviours that may contribute to accidents or injury.

It is generally recognized that a safety-conscious attitude and work practices contribute to a healthy, safe, and accident-free working environment.

It is imperative to apply and be familiar with the *Occupational Health and Safety Act* and Workplace Hazardous Material Information System (WHMIS) Regulations. As well, it's essential to determine workplace hazards and take measures to protect oneself, co-workers, the public, and the environment.

As safety education is an integral part of training in all jurisdictions, personal safety practices are not recorded in this document. However, the technical safety aspect relating to each task and sub-task are included throughout this analysis.

ANALYSIS

BLOCK A

OCCUPATIONAL SKILLS

Trends: *A general or basic knowledge of computers and related components is a growing trend for welders as equipment becomes more technically advanced and use of computers becomes more prevalent.*

Task 1 **Interprets blueprints and drawings.**

Related Components: Not applicable.

Materials: Not applicable.

Tools and Equipment: Drawings, specifications, resource materials, scales, measuring equipment.

Sub-task

1.01 **Determines required materials.**

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

1.01.01 knowledge of blueprints and drawings

1.01.02 knowledge of lines

1.01.03 knowledge of structural shapes and sizes

1.01.04 knowledge of material specifications

1.01.05 ability to read blueprints and drawings

Sub-task

1.02 **Identifies work processes.**

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

1.02.01 knowledge of welding processes

1.02.02 knowledge of welding process terminology

Supporting Knowledge & Abilities

1.02.03 knowledge of welding symbols

1.02.04 knowledge of company data sheets

1.02.05 ability to read and interpret welding symbols

1.02.06 ability to identify application of processes (when to apply which process)

Sub-task

1.03 Identifies dimensions and details.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

1.03.01 knowledge of metric system

1.03.02 knowledge of imperial system

1.03.03 knowledge of fractions and decimals

1.03.04 knowledge of fundamentals of drafting

1.03.05 ability to convert scale dimensions

1.03.06 ability to convert from one measurement system to another (metric and imperial)

1.03.07 ability to perform trade mathematical computations

Sub-task

1.04 Sketches details.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

1.04.01 knowledge of sketching techniques

1.04.02 ability to draw in two or three dimensions

1.04.03 ability to interpret two and three dimension drawings in order to perform work to specifications

Supporting Knowledge & Abilities

1.04.04 ability to extract information from blueprints and drawings

Task 2 Identifies materials.

Related Components: Piping, boilers, tanks, vessels, duct work, breaching, chillers, precipitators, turbines, heat exchangers, pumps, fans, fittings, structural steel.

Materials: Ferrous and non-ferrous material in the form of a plate, pipe, structural shapes.

Tools and Equipment: Magnets, files, grinding equipment.

Sub-task

2.01 Performs basic tests on materials.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

2.01.01 knowledge of metallurgy

2.01.02 knowledge of testing methods

2.01.03 ability to interpret test results in order to ensure conformity to specifications and requirements

Sub-task

2.02 Reviews documentation and markings.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
no	yes	yes	yes	yes	yes	no	yes	yes	yes	NV	yes	NV

2.02.01 knowledge of mill test reports

2.02.02 knowledge of traceability methods

2.02.03 knowledge of traceability requirements

2.02.04 ability to source required information

Task 3 Sources required information.

Related Components: Process equipment, consumables.

Materials: Equipment manuals, specification sheets, codes or standards, shop procedure manuals.

Tools and Equipment: Internet, computer, handbooks.

Sub-task

3.01 Interprets information related to operation of equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

3.01.01 knowledge of equipment information sources

3.01.02 knowledge of type of equipment

3.01.03 knowledge of location of information

3.01.04 ability to extract information on special or unique equipment operations

3.01.05 ability to apply information to operation of equipment as specified by work processes

Sub-task

3.02 Interprets information related to materials.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

3.02.01 knowledge of material information sources

3.02.02 knowledge of type of materials

3.02.03 knowledge of location of information

3.02.04 ability to identify unique or special information on materials

3.02.05 ability to apply information on use of materials in work processes

Sub-task

3.03 Identifies applicable specifications, codes and standards.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

3.03.01	knowledge of codes
3.03.02	knowledge of specifications
3.03.03	knowledge of standards
3.03.04	ability to interpret specifications in order to conform to standards and codes
3.03.05	ability to interpret specifications in order to apply them to work processes

Task 4 Prepares work area.

Related Components: Shop, work site.

Materials: Work materials related to type of welding process and consumables.

Tools and Equipment: Broom, vacuum cleaner, cart, dolly, crane, forklift.

Sub-task

4.01 Cleans work area.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

4.01.01	knowledge of good housekeeping practices
4.01.02	knowledge of types of cleaning materials and equipment
4.01.03	knowledge of cleaning procedures
4.01.04	knowledge of safety hazards

Supporting Knowledge & Abilities

4.01.05	knowledge of Workers' Compensation Board regulations and *Occupational Health and Safety Act*
4.01.06	ability to identify safety hazards

Sub-task

4.02 Plans sequence of operation. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

4 02.01	knowledge of assembly requirements
4.02.02	knowledge of codes
4.02.03	knowledge of weld procedure specifications (WPS)
4.02.04	knowledge of final product
4.02.05	knowledge of welding sequence
4.02.06	knowledge of possible distortion
4.02.07	ability to organize sequence of work
4.02.08	ability to visualise final components

Sub-task

4.03 Gathers work materials and equipment. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

4.03.01	knowledge of work plan
4.03.02	knowledge of finished component
4.03.03	knowledge of assembly requirements

Task 5 **Lays out materials.**

Related Components: Base metals.

Materials: Not applicable.

Tools and Equipment: Levels, squares, scribers, markers, stamps, hammers, punches, chalk line, plumb bob, tape measure, calculator.

Sub-task

5.01 **Develops templates.**

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

5.01.01 knowledge of drawings

5.01.02 knowledge of geometric functions

5.01.03 knowledge of template materials

5.01.04 ability to work to required tolerances

5.01.05 ability to layout patterns

5.01.06 ability to construct templates

Sub-task

5.02 **Transfers dimensions from drawings to materials.**

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

5.02.01 knowledge of measurements

5.02.02 knowledge of layout tools

5.02.03 knowledge of transfer methods

5.02.04 ability to measure

5.02.05 ability to use layout tools

Sub-task

5.03 Confirms material dimensions.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

5.03.01 knowledge of specifications

5.03.02 knowledge of measuring instruments

5.03.03 ability to use measuring instruments

Task 6 Prepares materials.

Related Components: Base metals.

Materials: Chemical cleaners (acetone, pastes, pickling compounds).

Tools and Equipment: Buffers and wire wheels, common hand tools, cutting tools, measuring instruments, lifting and hoisting equipment, safety equipment, power, pneumatic and hydraulic tools, jigs and fixtures, resource materials (handbooks), heating torches, attachments.

Sub-task

6.01 Cuts material to specifications.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

6.01.01 knowledge of cutting processes

6.01.02 knowledge of base metals

6.01.03 knowledge of cutting sequence

6.01.04 knowledge of specifications

6.01.05 knowledge of tolerances

6.01.06 knowledge of safe work practices specific to cutting (blocking), etc.

6.01.07 ability to identify material

Supporting Knowledge & Abilities

6.01.08 ability to use cutting equipment

6.01.09 ability to select tool for cutting specific type of material

Sub-task

6.02 Grinds materials.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

6.02.01 knowledge of type of base metal

6.02.02 knowledge of abrasives

6.02.03 knowledge of safe work practices specific to grinding

6.02.04 knowledge of fundamentals of grinding

6.02.05 ability to set up grinding equipment

6.02.06 ability to complete grinding process

Sub-task

6.03 Cleans weld area.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

6.03.01 knowledge of mechanical cleaning methods

6.03.02 knowledge of chemical cleaning methods

6.03.03 knowledge of cleaning equipment

6.03.04 knowledge of cleaning materials

6.03.05 knowledge of cleaning tolerances

6.03.06 knowledge of cleaning specifications

Supporting Knowledge & Abilities

6.03.07	knowledge of safety hazards specific to cleaning
6.03.08	ability to use cleaning tools
6.03.09	ability to determine required cleaning method
6.03.10	ability to clean to specifications and tolerances

Task 7 Fabricates components.

Related Components: Piping, boilers, tanks, vessels, duct work, breaching, chillers, precipitators, turbines, heat exchangers, pumps, fans, fittings, structural steel.

Materials: Ferrous and non-ferrous materials in the form of plate, pipe, structural shapes.

Tools and Equipment: Hand tools, cutting equipment, welding equipment, gouging equipment, power, pneumatic and hydraulic tools, jigs and fixtures, manipulators, lifting and hoisting equipment, measuring equipment, safety equipment, resource materials (handbooks), heating torches, attachments.

Sub-task

7.01 Selects required process.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

Supporting Knowledge & Abilities

7.01.01	knowledge of welding processes
7.01.02	knowledge of cutting processes
7.01.03	knowledge of gouging processes
7.01.04	knowledge of blueprints and drawings
7.01.05	knowledge of specifications
7.01.06	knowledge of base metals
7.01.07	ability to assess scope of work
7.01.08	ability to match process to requirements

Sub-task

7.02 Assembles components. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

7.02.01	knowledge of required equipment
7.02.02	knowledge of consumables
7.02.03	ability to read blueprints and drawings
7.02.04	ability to organise work in sequential order
7.02.05	ability to match consumables to metals

Sub-task

7.03 Preheats weld area (weldments). **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

7.03.01	knowledge of weld procedure specifications (WPS)/Data Sheet preheat and interpass requirements
7.03.02	knowledge of preheating effects on materials
7.03.03	knowledge of preheating procedures
7.03.04	knowledge of preheat equipment
7.03.05	knowledge of preheat equipment set up
7.03.06	ability to select preheat procedure
7.03.07	ability to set up preheat equipment
7.03.08	ability to set up preheat monitoring equipment

Sub-task

7.04 Tacks components. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

7.04.01	knowledge of welding processes
7.04.02	knowledge of tacking techniques
7.04.03	knowledge of potential distortion
7.04.04	knowledge of codes
7.04.05	knowledge of specifications
7.04.06	knowledge of required welder qualifications
7.04.07	ability to tack weld
7.04.08	ability to follow specifications

Sub-task

7.05 Finishes final product. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

7.05.01	knowledge of product specifications
7.05.02	knowledge of weld procedure specifications (WPS)
7.05.03	knowledge of drawings
7.05.04	ability to re-check dimensional and geometric tolerances
7.05.05	ability to weld to specifications

Task 8 Maintains equipment.

Related Components:	Power sources, power tools, hand tools, hoisting and lifting equipment, related accessories, oxy-fuel equipment, air and gas lines, related equipment, gouging equipment, components, measuring and testing equipment, pneumatic and hydraulic equipment.
Materials:	Oils, greases, lubricants, gaskets, liners, tips, cleaning materials, hose repair kits, o-rings, tape, wire.
Tools and Equipment:	Hand tools, vacuums, blow-down equipment, power tools.

Sub-task

8.01 Performs visual inspection of equipment. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

8.01.01	knowledge of manufacturers' specifications and recommendations
8.01.02	knowledge of inspection methods
8.01.03	knowledge of types of damage and wear
8.01.04	knowledge of severity of damage or wear
8.01.05	knowledge of lock-out procedures
8.01.06	ability to detect defects in equipment
8.01.07	ability to document and report defects
8.01.08	ability to apply lock-out procedures

Sub-task

8.02 Checks equipment for leaks. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

8.02.01	knowledge of documentation
8.02.02	knowledge of procedures for leak check

Supporting Knowledge & Abilities

8.02.03 knowledge of leak testing methods

8.02.04 ability to follow procedures for leak testing

8.02.05 ability to perform leak test

8.02.06 ability to repair leaks

Sub-task

8.03 Repairs leaks.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

8.03.01 knowledge of repair procedures

8.03.02 knowledge of repair materials

8.03.03 ability to repair within specifications and limits

8.03.04 ability to determine severity of leak and limits of repair capabilities

Sub-task

8.04 Checks protective devices operation and location.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

8.04.01 knowledge of types of protective devices

8.04.02 knowledge of protective device operation

8.04.03 knowledge of flashback arresters

8.04.04 knowledge of check valves

8.04.05 knowledge of dead-man (lock-out) switches

8.04.06 knowledge of manufacturers' specifications

Supporting Knowledge & Abilities

8.04.07	ability to distinguish between protective devices
8.04.08	ability to check for non-conformance
8.04.09	ability to interpret regulations in order to follow approved procedures

Task 9 Performs basic rigging operations.

Related Components: Piping, boilers, tanks, vessels, duct work, breaching, chillers, precipitators, turbines, heat exchangers, pumps, fans, fittings, structural steel.

Materials: Rigging handbook.

Tools and Equipment: Hoisting and lifting equipment, chain falls, come-alongs, tugger, jack, wire rope slings, rope, shackles, forklift, cranes, slings, spreader bars, supports, jacks and stands, hand tools, hydraulic tools, pry bars, wedges, cable clamps, plate clamps.

Sub-task

9.01 Ties knots.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

9.01.01	knowledge of types of ropes
9.01.02	knowledge of types of knots
9.01.03	ability to select required knot
9.01.04	ability to verify security of knots

Sub-task

9.02 Selects rigging equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

9.02.01	knowledge of slings

Supporting Knowledge & Abilities

9.02.02	knowledge of shackles
9.02.03	knowledge of lifting devices
9.02.04	knowledge of rigging hardware
9.02.05	knowledge of wire ropes
9.02.06	knowledge of identification markings
9.02.07	knowledge of manufacturers' specifications
9.02.08	ability to determine safe condition of equipment
9.02.09	ability to determine safe capacities
9.02.10	ability to verify inspection status of equipment

Sub-task

9.03 Performs signals.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

9.03.01	knowledge of location of signal person
9.03.02	knowledge of international rigging and hoisting hand signals
9.03.03	knowledge of alternate communication methods
9.03.04	ability to interpret hand signals in order to perform lifting operations
9.03.05	ability to communicate signals using audio communication devices
9.03.06	ability to identify signal person
9.03.07	ability to communicate with other personnel

Sub-task

9.04 Operates basic lifting devices. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

9.04.01	knowledge of occupational health and safety laws and regulations related to lifting devices
9.04.02	knowledge of provincial acts and regulations governing the performance of lifts
9.04.03	knowledge of lifting devices
9.04.04	knowledge of manufacturers' specifications
9.04.05	knowledge of lifting procedures
9.04.06	ability to estimate weight of load
9.04.07	ability to select proper rigging hardware
9.04.08	ability to attach proper rigging hardware
9.04.09	ability to apply safe operating practices

BLOCK B
QUALITY CONTROL

Trends: *To the implementation of stricter controls imposed by industry.*

Task 10 Complies with codes, specifications and standards.

Related Components: Sub-assembly components, sub-assemblies, assemblies (weldments and cuts).

Materials: Data sheets, code books, standards.

Tools and Equipment: Computer.

Sub-task

10.01 Complies with weld procedure specifications (WPS) and data sheets.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	no	yes	yes	yes	NV	yes	NV

10.01.01 knowledge of applicable codes

10.01.02 knowledge of weld procedure specifications and data sheets

10.01.03 knowledge of preheating practices

10.01.04 knowledge of interpass temperature procedures

10.01.05 knowledge of postheating practices

10.01.06 knowledge of heat treatment standards and practices

10.01.07 knowledge of heating effects on materials

10.01.08 ability to interpret weld procedure specifications (WPS)

10.01.09 ability to check tolerances for conformance

Sub-task

10.02 Ensures personal trade qualifications meet requirement.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

10.02.01	knowledge of applicable codes or standards
10.02.02	knowledge of provincial/territorial regulations
10.02.03	knowledge of applicable qualification tests
10.02.04	ability to check personal records
10.02.05	ability to update qualifications

Task 11 Verifies materials.

Related Components: Packing slips, product specifications, purchase orders, material stock, weld procedure specifications (WPS).

Materials: Not applicable.

Tools and Equipment: Measuring instruments, measuring tapes, gauges, callipers, micrometers, calculators.

Sub-task

11.01 Matches heat numbers against markings.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
no	yes	no	yes	yes	yes	yes	yes	yes	yes	NV	no	NV

11.01.01	knowledge of material traceability methods
11.01.02	knowledge of material traceability requirements
11.01.03	knowledge of material identification system
11.01.04	ability to transfer heat numbers
11.01.05	ability to verify heat numbers with mill test report (MTR)

Sub-task

11.02 Verifies consumables conform to specifications.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

11.02.01	knowledge of code/specification requirements
11.02.02	knowledge of weld procedure specifications (WPS)
11.02.03	knowledge of consumable identification markings
11.02.04	knowledge of packaging specifications
11.02.05	knowledge of consumables handling procedures
11.02.06	knowledge of consumables storage requirements
11.02.07	ability to check storage of consumables
11.02.08	ability to report deficiencies

Task 12 Performs inspections.

Related Components:	Sub-assembly components, sub-assemblies, assemblies (weldments and cuts).
Materials:	Weld procedure specifications, codes and standards, Quality Control (QC) documents, blueprints.
Tools and Equipment:	Measuring tapes, squares, callipers, weld gauges, flashlights, magnifying glasses, gap gauges, hi-low gauges, temperature sticks, pencil.

Sub-task

12.01 Examines components (fit-up and preparation) prior to assembly.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

12.01.01	knowledge of blueprints and drawings
12.01.02	knowledge of measuring tools
12.01.03	knowledge of measuring instruments
12.01.04	knowledge of applicable specifications
12.01.05	knowledge of applicable codes
12.01.06	knowledge of applicable standards
12.01.07	ability to read blueprints and drawings
12.01.08	ability to operate measuring tools
12.01.09	ability to operate measuring instruments

Sub-task

12.02 Examines completed welds.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

12.02.01	knowledge of visual defects
12.02.02	knowledge of relevant/non-relevant indications
12.02.03	knowledge of non destructive testing methods
12.02.04	knowledge of destructive testing methods
12.02.05	knowledge of required inspection tools
12.02.06	knowledge of required inspection materials
12.02.07	ability to identify visual defects

Supporting Knowledge & Abilities

12.02.08	ability to identify relevant/non-relevant indications
12.02.09	ability to use inspection tools
12.02.10	ability to document inspection findings

Sub-task

12.03 Measures completed welds.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

Supporting Knowledge & Abilities

12.03.01	knowledge of blueprints and drawings
12.03.02	knowledge of completed weld specifications
12.03.03	knowledge of weld gauges
12.03.04	knowledge of applicable codes
12.03.05	knowledge of applicable standards
12.03.06	knowledge of measuring equipment and tools
12.03.07	ability to read blueprints and drawings to determine required dimensions
12.03.08	ability to use measuring equipment and tools

Sub-task

12.04 Measures final product for compliance to blueprints and drawings.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

Supporting Knowledge & Abilities

12.04.01	knowledge of blueprints and drawings
12.04.02	knowledge of potential distortion
12.04.03	knowledge of specifications

Supporting Knowledge & Abilities

12.04.04	ability to read blueprints and drawings
12.04.05	ability to identify and detect distortion

BLOCK C

CUTTING PROCESSES

Trends:

Cutting using Water Jet: *This process is used in a variety of industries. There is no apparent increase or decrease in its use. Generally, welders do not widely use this cutting method.*

Lance Oxygen Cutting Process (LOC): *There is a continued use of lance oxygen cutting in steel mills and in demolition and other specialised areas and operations. At this time, there does not appear to be significant changes in the methods or the equipment.*

Laser Beam Cutting Process (LBC): *Laser beam cutting is becoming more widely used but has restrictions due to cost. Lasers are becoming more prevalent in manufacturing where distortion and precision cuts are major considerations.*

Plasma Arc Cutting Process (PAC): *Plasma arc cutting is on the increase.*

Cold Cutting Process: *Performed using a special saw for highly flammable ignition areas and is used on smaller cutting applications where water jet is used on larger flammable applications.*

Task 13 Cuts with mechanical and power tools.

Related Components: Base metals.

Materials: Abrasives, saw blades.

Tools and Equipment: Mechanical and power tools: grinders, abrasive saws, cold cut saws, band saws, shears, nibblers, chippers, drills, reciprocating saws, power hack saws, related tooling and set up tools, electricity/compressed air.

Sub-task

13.01 Selects mechanical and power cutting equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

13.01.01 knowledge of hand tools

13.01.02 knowledge of power tools

13.01.03 knowledge of mechanical tools

Supporting Knowledge & Abilities

13.01.04 knowledge of pneumatic equipment

13.01.05 knowledge of consumables

13.01.06 ability to match consumables to tool and job

Sub-task

13.02 Selects operating parameters. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

13.02.01 knowledge of tool functions

13.02.02 knowledge of tool capabilities

13.02.03 knowledge of manufacturers' recommendations

13.02.04 knowledge of base metal to be cut

13.02.05 knowledge of metal preparation requirements

13.02.06 knowledge of power tool input requirements

13.02.07 ability to match tool to work requirements

Sub-task

13.03 Sets up mechanical and power cutting equipment. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

13.03.01 knowledge of manufacturers' recommendations

13.03.02 knowledge of set-up procedures for selected mechanical and power cutting equipment

13.03.03 knowledge of intended use

13.03.04 knowledge of base metal to be cut

Supporting Knowledge & Abilities

13.03.05 ability to detect faulty equipment

13.03.06 ability to follow manufacturers' specifications

Sub-task

13.04 Operates mechanical and power cutting equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

13.04.01 knowledge of mechanical and power cutting equipment operation

13.04.02 knowledge of operating techniques

13.04.03 knowledge of required personal protective equipment

13.04.04 ability to secure workpiece

13.04.05 ability to determine quality of cut

13.04.06 ability to detect equipment malfunctions

13.04.07 ability to follow manufacturers' specifications

13.04.08 ability to apply mechanical and power cutting techniques

Task 14 Cuts using oxy-fuel gas cutting process (OFC).

Related Components: Base metals.

Materials: Fuel gas, oxygen.

Tools and Equipment: Oxy-fuel cutting equipment (manual, automated and mechanized), fuel gas and oxygen cylinders, other forms of delivery systems, fuel and oxygen regulators, flashback arrestors, check valves, hoses, cutting torches, torch head, cutting tips, assembly wrenches, radiograph tractor and track, barrel torch and holder, barrel torch and carrier assembly, automated driver and server.

Sub-task

14.01 Selects oxy-fuel cutting equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

14.01.01	knowledge of fundamentals of oxy-fuel gas cutting process (OFC)
14.01.02	knowledge of types of regulators
14.01.03	knowledge of operation of regulators
14.01.04	knowledge of flashback arrestors
14.01.05	knowledge of types of hoses
14.01.06	knowledge of types of torch bodies
14.01.07	knowledge of torch attachments
14.01.08	knowledge of manual oxy-fuel cutting equipment
14.01.09	knowledge of automated oxy-fuel cutting equipment
14.01.10	knowledge of mechanized oxy-fuel cutting equipment

Sub-task

14.02 Selects fuel gas.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

14.02.01	knowledge of characteristics of fuel gases
14.02.02	knowledge of fuel gas delivery systems
14.02.03	knowledge of cylinder and gases handling procedures
14.02.04	knowledge of cylinder and gases storage requirements

Supporting Knowledge & Abilities

14.02.05	knowledge of hazards associated with different fuel gases
14.02.06	ability to match fuel gas to type of cutting equipment
14.02.07	ability to identify type of fuel gas from information on label

Sub-task

14.03 Selects tips. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

14.03.01	knowledge of type of base metal
14.03.02	knowledge of base metal thickness
14.03.03	knowledge of tip functions
14.03.04	knowledge of required cut
14.03.05	knowledge of types of tips
14.03.06	ability to match tip to base metal and required cut
14.03.07	ability to differentiate between tips

Sub-task

14.04 Selects operating parameters. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

14.04.01	knowledge of base metal thickness
14.04.02	knowledge of tip sizes
14.04.03	knowledge of type of fuel gas used
14.04.04	knowledge of regulations

Supporting Knowledge & Abilities

14.04.05	knowledge of manufacturers' recommendations
14.04.06	knowledge of trade related and process related guidelines
14.04.07	ability to match fuel gas and oxygen pressures to cut specifications
14.04.08	ability to reference information

Sub-task

14.05 Sets up oxy-fuel cutting equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

14.05.01	knowledge of types of oxy-fuel cutting equipment and their operation
14.05.02	knowledge of set-up procedures for selected oxy-fuel cutting equipment
14.05.03	knowledge of test procedures for selected oxy-fuel cutting equipment
14.05.04	knowledge of oxy-fuel gas safe cutting practices
14.05.05	ability to follow safe set-up procedures for selected type of oxy-fuel cutting equipment
14.05.06	ability to reference manufacturers' instructions
14.05.07	ability to perform set-up tests

Sub-task

14.06 Operates oxy-fuel cutting equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

14.06.01	knowledge of required task-specific personal protective clothing and equipment for oxy-fuel gas cutting
14.06.02	knowledge of safe operating practices
14.06.03	knowledge of metallurgy
14.06.04	knowledge of types of flames
14.06.05	knowledge of flashback conditions
14.06.06	knowledge of backfire burnback conditions
14.06.07	knowledge of cutting techniques
14.06.08	ability to recognize flashback
14.06.09	ability to recognize backfire burnback conditions
14.06.10	ability to prevent flashback
14.06.11	ability to prevent backfire burnback
14.06.12	ability to correct flashback conditions
14.06.13	ability to correct backfire burnback conditions
14.06.14	ability to light and adjust torch
14.06.15	ability to initiate cut
14.06.16	ability to detect defects in cut
14.06.17	ability to apply oxy-fuel cutting techniques

Sub-task

14.07 Shuts down oxy-fuel cutting equipment. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

14.07.01	knowledge of shutdown sequence of selected oxy-fuel cutting equipment
14.07.02	ability to check regulators
14.07.03	ability to perform a complete shutdown

Task 15 Cuts using plasma arc cutting process (PAC).

Related Components:	Base metals.
Materials:	Plasma gas and/or compressed air.
Tools and Equipment:	Plasma arc cutting equipment (manual, automated and mechanized), plasma gas, compressed air, inert gases, regulators and hoses, hand torches, barrel torches, electrodes, nozzles, related components and tool kits, radiographs, tracks, racks, drivers and server systems.

Sub-task

15.01 Selects plasma arc cutting equipment. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

15.01.01	knowledge of fundamentals of plasma arc cutting process (PAC)
15.01.02	knowledge of power sources
15.01.03	knowledge of manual plasma arc cutting equipment
15.01.04	knowledge of automated plasma arc cutting equipment
15.01.05	knowledge of mechanized plasma arc cutting equipment

Supporting Knowledge & Abilities

15.01.06 knowledge of regulators

15.01.07 knowledge of torches

15.01.08 knowledge of quality of finished product

15.01.09 ability to match equipment to requirements

Sub-task

15.02 Selects gases.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

15.02.01 knowledge of type of base metal and thickness

15.02.02 knowledge of types of gases

15.02.03 knowledge of gas characteristics

15.02.04 knowledge of compressed air source

15.02.05 knowledge of compressed air characteristics

15.02.06 knowledge of filters

15.02.07 knowledge of dryers

15.02.08 ability to match gases to application

Sub-task

15.03 Selects consumables.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

15.03.01 knowledge of electrodes

15.03.02 knowledge of cups/shields

15.03.03 knowledge of tips

15.03.04 knowledge of tip/orifice sizes

Supporting Knowledge & Abilities

15.03.05 ability to visually inspect tips

15.03.06 ability to visually inspect cups

15.03.07 ability to visually check orifice sizes

15.03.08 ability to determine suitability of tips and electrodes

15.03.09 ability to determine suitability of cups/shields

15.03.10 ability to determine suitability of orifices

Sub-task

15.04 Selects operating parameters. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

15.04.01 knowledge of manufacturers' specifications and recommendations

15.04.02 knowledge of required base metal

15.04.03 knowledge of base metal thickness

15.04.04 knowledge of operating pressure

15.04.05 ability to interpret information relative to operating parameters

Sub-task

15.05 Sets up plasma arc cutting equipment. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

15.05.01 knowledge of manufacturers' recommendations

15.05.02 knowledge of procedures for assembly of plasma components

Supporting Knowledge & Abilities

15.05.03 knowledge of types of plasma arc cutting equipment and their operation

15.05.04 knowledge of set-up procedures for selected plasma arc cutting equipment

15.05.05 knowledge of required ventilation

15.05.06 ability to verify plasma arc cutting equipment operation

15.05.07 ability to follow set-up procedures for selected plasma arc cutting equipment

15.05.08 ability to verify operation of ventilation equipment

Sub-task

15.06 Operates plasma arc cutting equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

15.06.01 knowledge of metallurgy as it applies to plasma arc cutting

15.06.02 knowledge of plasma arc cutting techniques

15.06.03 knowledge of cutting sequence

15.06.04 knowledge of required task-specific personal protective equipment for plasma arc cutting

15.06.05 knowledge of shutdown procedures for selected plasma arc cutting equipment

15.06.06 ability to verify selected plasma arc cutting equipment operation

15.06.07 ability to detect equipment malfunctions

15.06.08 ability to identify defects in cuts

15.06.09 ability to apply plasma arc cutting techniques

Task 16 Cuts using air carbon arc cutting process (ACA).

Related Components: Base metals.

Materials: Compressed air, carbon graphite electrodes.

Tools and Equipment: Air carbon arc cutting equipment (manual, automated and mechanized), power sources, cables, compressors, delivery systems, cylinders, cutting torch, personal protective equipment.

Sub-task

16.01 Selects air carbon arc cutting equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

16.01.01 knowledge of fundamentals of air carbon arc cutting (ACA)

16.01.02 knowledge of power sources

16.01.03 knowledge of compressed air sources

16.01.04 knowledge of cable sizes

16.01.05 knowledge of manual air carbon arc cutting equipment

16.01.06 knowledge of automated air carbon arc cutting equipment

16.01.07 knowledge of mechanized air carbon arc cutting equipment

16.01.08 ability to assess requirements

Sub-task

16.02 Selects consumables.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

16.02.01 knowledge of types of electrodes

16.02.02 knowledge of electrode sizes

16.02.03 knowledge of electrode shapes

Supporting Knowledge & Abilities

16.02.04 knowledge of applicable consumables

16.02.05 ability to differentiate between consumables

Sub-task

16.03 Selects operating parameters. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

16.03.01 knowledge of base metal thickness

16.03.02 knowledge of voltage

16.03.03 knowledge of polarity

16.03.04 knowledge of amperage

16.03.05 knowledge of voltage and amperage related to electrode size

16.03.06 knowledge of required air-pressure

16.03.07 knowledge of required compressed air source

16.03.08 ability to set dials according to requirements

Sub-task

16.04 Sets up air carbon arc cutting equipment. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

16.04.01 knowledge of air carbon arc equipment components

16.04.02 knowledge of ventilation requirements

16.04.03 knowledge of set-up procedures for selected air carbon arc cutting equipment

16.04.04 ability to verify set-up

Sub-task

16.05 Operates air carbon arc cutting equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

16.05.01	knowledge of air carbon arc cutting techniques
16.05.02	knowledge of required task-specific personal protective clothing and equipment for carbon arc cutting
16.05.03	knowledge of shutdown procedures for selected air carbon arc cutting equipment
16.05.04	knowledge of safety hazards (fires, etc.)
16.05.05	ability to determine quality of cut
16.05.06	ability to detect carbon deposits
16.05.07	ability to detect equipment malfunctions
16.05.08	ability to apply the appropriate cutting techniques

Task 17 Cuts using electric arc cutting process (AC).

Related Components:	Base metals.
Materials:	Electrodes.
Tools and Equipment:	Electric arc cutting equipment, power supply, cables, electrode holders, ground clamps, personal protective equipment.

Sub-task

17.01 Selects electric arc cutting equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	no	yes	no	yes	yes	no	NV	yes	NV

17.01.01	knowledge of fundamentals of electrical arc cutting process

Supporting Knowledge & Abilities

17.01.02	knowledge of power sources
17.01.03	knowledge of types of electrodes
17.01.04	knowledge of electrode sizes
17.01.05	knowledge of characteristics of electrode holders
17.01.06	knowledge of characteristics of cables
17.01.07	knowledge of characteristics of ground clamps
17.01.08	ability to assess requirements
17.01.09	ability to match equipment to requirements

Sub-task

17.02 Selects consumables.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	no	yes	no	yes	yes	no	NV	yes	NV

17.02.01	knowledge of types of electrodes
17.02.02	knowledge of electrode sizes
17.02.03	knowledge of electrode shapes
17.02.04	knowledge of applicable consumables
17.02.05	ability to differentiate between consumables

Sub-task

17.03 Selects operating parameters.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	no	yes	no	yes	yes	no	NV	yes	NV

17.03.01	knowledge of type of base metal
17.03.02	knowledge of current and amperage related to electrode size

Supporting Knowledge & Abilities

17.03.03 knowledge of cut specifications

17.03.04 ability to match operating parameters to cut specifications

Sub-task

17.04 Sets up electric arc cutting equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	no	yes	no	yes	yes	no	NV	yes	NV

17.04.01 knowledge of manufacturers' recommendations

17.04.02 knowledge of required task-specific personal protective equipment for electric arc cutting

17.04.03 knowledge of ventilation requirements

17.04.04 knowledge of set-up procedures for selected electric arc cutting equipment

17.04.05 ability to verify set-up of electric arc cutting equipment

17.04.06 ability to change equipment around for a more efficient set-up

Sub-task

17.05 Operates electric arc cutting equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	no	yes	no	yes	yes	no	NV	yes	NV

17.05.01 knowledge of electric arc cutting techniques

17.05.02 knowledge of shutdown procedures

17.05.03 ability to detect equipment malfunctions

17.05.04 ability to make required equipment adjustments

Supporting Knowledge & Abilities

17.05.05	ability to change cutting techniques as required
17.05.06	ability to detect cut defects

BLOCK D
GOUGING PROCESSES

Trends: *To an increase in application.*

Task 18 Gouges using air carbon arc cutting process (ACA).

Related Components: Base metals.

Materials: Compressed air, carbon graphite electrodes.

Tools and Equipment: Air carbon arc cutting equipment (manual, automated and mechanized), power source, gouging electrode holder, air compressor.

Sub-task

18.01 Selects air carbon arc cutting equipment for gouging.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

18.01.01 knowledge of fundamentals of air carbon arc cutting process as applied to gouging

18.01.02 knowledge of power sources

18.01.03 knowledge of manual air carbon arc cutting equipment used for gouging

18.01.04 knowledge of automated air carbon arc cutting equipment used for gouging

18.01.05 knowledge of mechanized air carbon arc cutting equipment used for gouging

18.01.06 knowledge of cable size

18.01.07 knowledge of compressed air sources

18.01.08 ability to assess requirements

Sub-task

18.02 Selects consumables. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

18.02.01	knowledge of sizes and shapes of electrodes
18.02.02	knowledge of application of consumables
18.02.03	ability to differentiate between consumables

Sub-task

18.03 Selects operating parameters. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

18.03.01	knowledge of base metal thickness
18.03.02	knowledge of required depth of gouge
18.03.03	knowledge of voltage
18.03.04	knowledge of polarity
18.03.05	knowledge of amperage
18.03.06	knowledge of voltage and amperage related to electrode size
18.03.07	knowledge of required air-pressure and volume
18.03.08	ability to set dials according to requirements

Sub-task

18.04 Sets up air carbon arc cutting equipment for gouging. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

18.04.01	knowledge of air carbon arc cutting components

Supporting Knowledge & Abilities

18.04.02	knowledge of set-up procedures for air carbon arc cutting equipment used to gouge
18.04.03	knowledge of ventilation procedures
18.04.04	ability to verify set-up of air carbon arc cutting equipment used to gouge

Sub-task

18.05 Operates air carbon arc cutting equipment for gouging.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

18.05.01	knowledge of air carbon arc gouging techniques
18.05.02	knowledge of shutdown procedures for selected air carbon arc cutting equipment
18.05.03	knowledge of safety hazards
18.05.04	ability to determine quality of gouge
18.05.05	ability to detect carbon deposits
18.05.06	ability to detect equipment malfunctions
18.05.07	ability to make necessary equipment adjustments

Task 19 Gouges using plasma arc cutting process (PAC).

Related Components:	Base metals.
Materials:	Compressed air/gases.
Tools and Equipment:	Plasma arc cutting equipment (manual, automated and mechanized), power sources, air compressors, hoses/cables, torch heads complete with attachments.

Sub-task

19.01 Selects plasma arc cutting equipment for gouging.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	no	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

19.01.01	knowledge of fundamentals of plasma arc cutting process (PAC) as applied to gouging
19.01.02	knowledge of quality of finished product
19.01.03	knowledge of manual plasma arc cutting equipment used for gouging
19.01.04	knowledge of automated plasma arc cutting equipment used for gouging
19.01.05	knowledge of mechanized plasma arc cutting equipment used for gouging
19.01.06	knowledge of power sources
19.01.07	knowledge of regulators
19.01.08	knowledge of torches
19.01.09	ability to match plasma arc cutting equipment to application

Sub-task

19.02 Selects gases.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	no	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

19.02.01	knowledge of base metal to be gouged
19.02.02	knowledge of characteristics of gases
19.02.03	knowledge of characteristics of filters
19.02.04	knowledge of characteristics of dryers
19.02.05	knowledge of compressed air sources
19.02.06	ability to match gases to work requirements

Sub-task

19.03 Selects consumables. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	no	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

19.03.01	knowledge of characteristics of electrodes
19.03.02	knowledge of characteristics of cups/shields
19.03.03	knowledge of characteristics of gouging tips
19.03.04	knowledge of gouging tip/orifice sizes
19.03.05	ability to visually inspect cups/shields
19.03.06	ability to visually inspect gouging tips
19.03.07	ability to visually check gouging tip/orifice sizes

Sub-task

19.04 Selects operating parameters. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	no	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

19.04.01	knowledge of manufacturers' specifications and recommendations
19.04.02	knowledge of base metal thickness
19.04.03	knowledge of operating pressure
19.04.04	knowledge of depth of gouge

Sub-task

19.05 Sets up plasma arc cutting equipment for gouging.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	no	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

19.05.01	knowledge of manual plasma arc cutting equipment used for gouging
19.05.02	knowledge of automated plasma arc cutting equipment used for gouging
19.05.03	knowledge of mechanized plasma arc cutting equipment used for gouging
19.05.04	knowledge of manufacturers' recommendations
19.05.05	knowledge of assembly of plasma components
19.05.06	knowledge of amperage
19.05.07	knowledge of proper ventilation procedures
19.05.08	knowledge of set-up procedures for selected plasma arc cutting equipment used to gouge
19.05.09	ability to follow set-up procedures for selected plasma arc cutting equipment used to gouge
19.05.10	ability to verify set-up of selected plasma arc cutting equipment used to gouge

Sub-task

19.06 Operates plasma arc cutting equipment for gouging.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	no	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

19.06.01	knowledge of metallurgy as it relates to gouging using plasma arc process
19.06.02	knowledge of plasma gouging techniques
19.06.03	knowledge of gouging sequence

Supporting Knowledge & Abilities

19.06.04	knowledge of potential safety hazards
19.06.05	knowledge of required task-specific personal protective clothing and equipment
19.06.06	knowledge of shutdown procedures
19.06.07	ability to detect equipment malfunctions
19.06.08	ability to make necessary equipment adjustments
19.06.09	ability to identify defects in gouges
19.06.10	ability to apply appropriate gouging techniques

Task 20 Gouges using oxy-fuel gas cutting process (OFC).

Related Components: Base metals.

Materials: Oxygen, fuel gas.

Tools and Equipment: Oxy-fuel gas cutting equipment (manual, automated and mechanized), regulators, check valves, flashback arresters, hoses, torches, gouging tips, cylinders/manifolds.

Sub-task

20.01 Selects oxy-fuel gas cutting equipment for gouging.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	no	yes	yes	yes	yes	NV	yes	NV

20.01.01	knowledge of fundamentals of oxy-fuel gas cutting process (OFC) as applied to gouging
20.01.02	knowledge of regulators
20.01.03	knowledge of hoses
20.01.04	knowledge of torch bodies
20.01.05	knowledge of torch attachments

Supporting Knowledge & Abilities

20.01.06 knowledge of manual oxy-fuel cutting equipment used for gouging

20.01.07 knowledge of automated oxy-fuel cutting equipment used for gouging

20.01.08 knowledge of mechanized oxy-fuel cutting equipment used for gouging

20.01.09 ability to match oxy-fuel cutting equipment to application

Sub-task

20.02 Selects fuel gas.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	no	yes	yes	yes	yes	NV	yes	NV

20.02.01 knowledge of characteristics of fuel gases

20.02.02 knowledge of fuels

20.02.03 knowledge of fuel systems

20.02.04 knowledge of handling procedures for cylinders and gases

20.02.05 knowledge of storage procedures for cylinders and gases

20.02.06 ability to identify type of gas by label

Sub-task

20.03 Selects tips.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	no	yes	yes	yes	yes	NV	yes	NV

20.03.01 knowledge of type of base metal

20.03.02 knowledge of base metal thickness

20.03.03 knowledge of types of gouging tips

Supporting Knowledge & Abilities

20.03.04 knowledge of gouging tip functions

20.03.05 knowledge of depth of gouge

20.03.06 ability to differentiate between tips

Sub-task

20.04 Selects operating parameters. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	no	yes	yes	yes	yes	NV	yes	NV

20.04.01 knowledge of equipment

20.04.02 knowledge of fuel characteristics

20.04.03 knowledge of gas characteristics

20.04.04 knowledge of regulations

20.04.05 knowledge of manufacturers' recommendations

20.04.06 knowledge of trade related and other applicable guidelines

20.04.07 ability to reference information specific to working pressures

Sub-task

20.05 Sets up oxy-fuel gas cutting equipment for gouging. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	no	yes	yes	yes	yes	NV	yes	NV

20.05.01 knowledge of oxy-fuel gas cutting process (OFC) safe handling practices

20.05.02 knowledge of set-up procedures for oxy-fuel cutting equipment used to gouge

20.05.03 knowledge of leak test procedures

Supporting Knowledge & Abilities

20.05.04 ability to follow safe work procedures

20.05.05 ability to reference manufacturers' instructions

20.05.06 ability to check for equipment leaks

20.05.07 ability to verify set-up

Sub-task

20.06 Operates oxy-fuel gas cutting equipment for gouging.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	no	yes	yes	yes	yes	NV	yes	NV

20.06.01 knowledge of required task-specific personal protective equipment

20.06.02 knowledge of safe operating practices

20.06.03 knowledge of gouging techniques

20.06.04 knowledge of types of flames

20.06.05 knowledge of flashback conditions

20.06.06 knowledge of backfire burnback conditions

20.06.07 ability to recognize flashback

20.06.08 ability to recognize backfire burnback

20.06.09 ability to prevent flashback

20.06.10 ability to prevent backfire burnback

20.06.11 ability to correct flashback conditions

20.06.12 ability to correct backfire burnback conditions

20.06.13 ability to light and adjust torch

20.06.14 ability to initiate gouge

20.06.15 ability to detect defects in gouges

Supporting Knowledge & Abilities

20.06.16 ability to detect equipment malfunctions

20.06.17 ability to make required equipment adjustments

20.06.18 ability to apply appropriate gouging techniques

Sub-task

20.07 Shuts-down oxy-fuel gas cutting equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	no	yes	yes	yes	yes	NV	yes	NV

20.07.01 knowledge of shut down procedures for selected oxy-fuel cutting equipment

20.07.02 ability to check regulators

20.07.03 ability to perform complete shutdown

BLOCK E

WELDING PROCESSES

Trends:

Electron Beam Welding (EBW): *is used in sophisticated manufacturing. A highly-specialised process; not typically used in field and shop fabricating or general manufacturing; not increasing in popularity and/or use.*

Thermit Welding (TW): *A specialised process (a form of casting) whereby moulds or shoes are required to control the flow of liquid iron to the desired shape. Process consists of a mixture of iron oxide and aluminum both in powder form, and bringing the mixture to a temperature above the melting point of the iron. No significant increase in use over the past decade.*

Electro-slag Welding Process (ESW) and Electro-gas Welding Process (EGW): *Developed for very thick sections or joints - no edge preparations required. Single pass welds in a vertical up position. Uses up to three electrodes, solid or flux core wires - requires shoes (moulds) that move vertically up as the weld progresses. No significant increase in the use of this process in the past decade.*

Laser Beam Welding (LBW): *Becoming more commonly used in the aeronautics and medical industries. Cost considerations restrict its use. Laser welding is used in automated and or robotic applications.*

Thermal Spray Process (THSP) (Metal Surfacing): *A process where a layer of metal is bonded or fused to the base material (usually metal) may be used for hard surfacing, abrasive wear, physical and chemical protection. Thermal spraying includes electric arc spraying, flame spraying, and plasma spraying.*

Friction Welding (FRW): *Mainly used for joining rebar, parts dissimilar metals and tubes. Parts must be of a size and shape in order to be rotated.*

Plasma Arc Welding (PAW): *Widely used on medical equipment. Plasma arc is more often used to compliment gas tungsten arc welding (GTAW). This process is widely used for welding light gauge materials.*

Joining using Friction Stir Welding: *Is to become more significant especially in the high specialised industries. (high tech)*

Plastic Welding: *An introduction to plastic welding is warranted. Although not often used it is seen in agricultural equipment, automotive applications, mining, piping and chemical industries.*

Task 21 Welds using oxy-fuel gas welding process (OFW).

Related Components: Base metals.

Materials: Filler metals.

Tools and Equipment: Oxy-fuel gas cutting equipment (manual, automated and mechanized), fuel gas and oxygen cylinders, other forms of delivery systems, fuel and oxygen regulators, flashback arrestors, check valves, hoses, cutting torches, torch head, cutting tips, assembly wrenches, radiograph tractor and track, barrel torch and holder, barrel torch and carrier assembly, automated driver and server.

Sub-task

21.01 Selects oxy-fuel gas welding equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	no	yes	yes	yes	yes	NV	yes	NV

21.01.01 knowledge of fundamentals of oxy-fuel gas welding process (OFW)

21.01.02 knowledge of types of equipment

21.01.03 knowledge of regulators

21.01.04 knowledge of flashback arrestors

21.01.05 knowledge of hoses

21.01.06 knowledge of types of torch bodies

21.01.07 knowledge of torch attachments

21.01.08 ability to match equipment to application

Sub-task

21.02 Selects fuel gas.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	no	yes	yes	yes	yes	NV	yes	NV

21.02.01 knowledge of characteristics of fuel gases

21.02.02 knowledge of fuel gas delivery systems

Supporting Knowledge & Abilities

21.02.03 knowledge of cylinder and gases handling procedures

21.02.04 knowledge of cylinder and gases storage requirements

21.02.05 knowledge of hazards associated with different fuel gases

21.02.06 ability to match fuel gas to type of equipment

21.02.07 ability to identify type of fuel gas from information on label

Sub-task

21.03 Selects tips.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	no	yes	yes	yes	yes	NV	yes	NV

21.03.01 knowledge of type of base metal

21.03.02 knowledge of base metal thickness

21.03.03 knowledge of tip functions

21.03.04 knowledge of required weld

21.03.05 knowledge of types of tips

21.03.06 ability to match tip to base metal and required weld

21.03.07 ability to differentiate between tips

Sub-task

21.04 Selects consumables.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	no	yes	yes	yes	yes	NV	yes	NV

21.04.01 knowledge of types of gases

21.04.02 knowledge of fuel delivery systems

Supporting Knowledge & Abilities

21.04.03 knowledge of handling procedures for cylinders and gases

21.04.04 knowledge of storage procedures for cylinders and gases

21.04.05 knowledge of fluxes

21.04.06 knowledge of filler metals

21.04.07 ability to identify type of gas by label

Sub-task

21.05 Selects operating parameters. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	no	yes	yes	yes	yes	NV	yes	NV

21.05.01 knowledge of base metal thickness

21.05.02 knowledge of welding tip sizes

21.05.03 knowledge of regulations

21.05.04 knowledge of manufacturers' recommendations

21.05.05 knowledge of other task specific guidelines

21.05.06 ability to reference information

Sub-task

21.06 Sets up oxy-fuel gas welding equipment. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	no	yes	yes	yes	yes	NV	yes	NV

21.06.01 knowledge of set-up procedures

21.06.02 knowledge of oxy-fuel gas welding safe practices

21.06.03 knowledge of equipment leak test procedures

Supporting Knowledge & Abilities

21.06.04 ability to follow safe procedures

21.06.05 ability to reference manufacturers' instructions

Sub-task

21.07 Operates oxy-fuel gas welding equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	no	yes	yes	yes	yes	NV	yes	NV

21.07.01 knowledge of required task-specific personal protective clothing and equipment

21.07.02 knowledge of safe operating practices

21.07.03 knowledge of flashback conditions

21.07.04 knowledge of backfire burnback conditions

21.07.05 knowledge of welding techniques

21.07.06 knowledge of metallurgy

21.07.07 knowledge of types of flames

21.07.08 knowledge of braze welding techniques

21.07.09 knowledge of brazing fluxes

21.07.10 knowledge of flame temperatures

21.07.11 knowledge of metal fusion techniques

21.07.12 ability to recognize flashback

21.07.13 ability to recognize backfire burnback

21.07.14 ability to prevent flashback conditions

21.07.15 ability to prevent backfire burnback conditions

21.07.16 ability to light and adjust torch

21.07.17 ability to apply appropriate welding techniques

Supporting Knowledge & Abilities

21.07.18 ability to detect defects in weld

Sub-task

21.08 Shuts down oxy-fuel gas welding equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	no	yes	yes	yes	yes	NV	yes	NV

21.08.01 knowledge of shutdown sequence

21.08.02 ability to check regulators

21.08.03 ability to perform complete shutdown

Task 22 Welds using shielded metal arc welding process (SMAW).

Related Components: Base metals.

Materials: Electrodes.

Tools and Equipment: Shielded metal arc welding equipment, power source, welding cables, electrode holder, ground clamp.

Sub-task

22.01 Selects shielded metal arc welding equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

22.01.01 knowledge of fundamentals of shielded metal arc welding (SMAW) process

22.01.02 knowledge of power sources

22.01.03 knowledge of type and thickness of metal

22.01.04 knowledge of alternating current

22.01.05 knowledge of direct current

Supporting Knowledge & Abilities

22.01.06 knowledge of polarity

22.01.07 knowledge of duty cycle

22.01.08 knowledge of cable sizes

22.01.09 knowledge of remote accessories

22.01.10 knowledge of quality of end product

22.01.11 ability to match shielded metal arc welding equipment to application

Sub-task

22.02 Selects consumables. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

22.02.01 knowledge of characteristics of electrodes

22.02.02 knowledge of electrode handling procedures

22.02.03 knowledge of electrode storage requirements

22.02.04 knowledge of metallurgy

22.02.05 knowledge of base metal

22.02.06 knowledge of manufacturers' specifications

22.02.07 ability to determine condition of electrodes

22.02.08 ability to follow manufacturers' recommendations related to electrodes, application and storage

Sub-task

22.03 Selects operating parameters. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

22.03.01 knowledge of required voltage and amperage related to electrode size

Supporting Knowledge & Abilities

22.03.02 knowledge of alternating current

22.03.03 knowledge of direct current

22.03.04 knowledge of polarity

22.03.05 knowledge of current characteristics

22.03.06 knowledge of amperage characteristics

22.03.07 ability to follow manufacturers' recommendations

Sub-task

22.04 Sets up shielded metal arc welding equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

22.04.01 knowledge of welding cables

22.04.02 knowledge of set-up procedures for shielded metal arc welding equipment

22.04.03 knowledge of manufacturers' recommendations

22.04.04 ability to hook up cables to proper polarity

22.04.05 ability to check cables and connections

Sub-task

22.05 Operates shielded metal arc welding equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

22.05.01 knowledge of required task-specific personal protective clothing and equipment

22.05.02 knowledge of ventilation requirements

22.05.03 knowledge of selected shielded metal arc welding equipment operating procedures

Supporting Knowledge & Abilities

22.05.04	knowledge of characteristics of electrodes during welding process
22.05.05	knowledge of welding techniques
22.05.06	knowledge of shutdown procedures of welding equipment
22.05.07	ability to manipulate electrodes
22.05.08	ability to detect flaws
22.05.09	ability to remove slag
22.05.10	ability to remove spatter
22.05.11	ability to detect welding equipment malfunctions
22.05.12	ability to make necessary welding equipment adjustments
22.05.13	ability to apply appropriate welding techniques

Task 23 Welds using flux cored arc welding process (FCAW).

Related Components:	Base metals.
Materials:	Electrode wire, gas.
Tools and Equipment:	Flux cored arc welding equipment (semi-automated and mechanized), power sources, wire feeders, flow meters, regulators, guns, liners, rollers, cooling systems, contact tips, nozzles, diffusers.

Sub-task

23.01 Selects flux cored arc welding equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

23.01.01	knowledge of fundamentals of flux cored arc welding process (FCAW)

Supporting Knowledge & Abilities

23.01.02	knowledge of semi-automated flux cored arc welding equipment
23.01.03	knowledge of mechanized flux cored arc welding equipment
23.01.04	knowledge of power sources
23.01.05	knowledge of type and thickness of base metal
23.01.06	knowledge of cable sizes
23.01.07	knowledge of direct current
23.01.08	knowledge of polarity
23.01.09	knowledge of duty cycle
23.01.10	knowledge of quality of end product
23.01.11	knowledge of wire feeders
23.01.12	knowledge of drive rolls
23.01.13	knowledge of guns
23.01.14	knowledge of contact tips
23.01.15	knowledge of nozzles
23.01.16	knowledge of gas diffusers
23.01.17	knowledge of cooling systems
23.01.18	ability to match welding equipment to application

Sub-task

23.02 Selects consumables.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

23.02.01	knowledge of metal cored wires

Supporting Knowledge & Abilities

23.02.02	knowledge of shielded/self-shielded electrode wires
23.02.03	knowledge of characteristics of shielding gases
23.02.04	knowledge of wire handling procedures
23.02.05	knowledge of wire storage requirements
23.02.06	ability to detect damage or defects in consumables
23.02.07	ability to follow manufacturers' recommendations

Sub-task

23.03 Selects operating parameters. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

23.03.01	knowledge of direct current
23.03.02	knowledge of polarity
23.03.03	knowledge of current characteristics
23.03.04	knowledge of voltage characteristics
23.03.05	knowledge of wire feed speed (current)
23.03.06	knowledge of filler metal transfer modes
23.03.07	knowledge of gas flow rates
23.03.08	knowledge of pulsing techniques
23.03.09	knowledge of wire stick out
23.03.10	ability to follow manufacturers' recommendations
23.03.11	ability to make required adjustments

Sub-task

23.04 Sets up flux cored arc welding equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

23.04.01	knowledge of manufacturers' recommendations
23.04.02	knowledge of welding cables
23.04.03	knowledge of gas cylinder safety
23.04.04	knowledge of equipment leak testing procedures
23.04.05	knowledge of troubleshooting techniques
23.04.06	knowledge of equipment set-up procedures
23.04.07	ability to hook up cables to proper polarity
23.04.08	ability to check cables and connections
23.04.09	ability to check for equipment leaks

Sub-task

23.05 Operates flux cored arc welding equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

23.05.01	knowledge of required task-specific personal protective clothing and equipment
23.05.02	knowledge of ventilation requirements
23.05.03	knowledge of welding techniques
23.05.04	knowledge of characteristics of electrodes during welding process
23.05.05	knowledge of pulsing techniques
23.05.06	knowledge of equipment maintenance requirements

Supporting Knowledge & Abilities

23.05.07	knowledge of shutdown procedures
23.05.08	ability to manipulate guns
23.05.09	ability to detect flaws
23.05.10	ability to remove spatter
23.05.11	ability to remove slag
23.05.12	ability to make welding equipment adjustments
23.05.13	ability to maintain welding equipment
23.05.14	ability to apply appropriate welding techniques

Task 24 Welds using gas metal arc welding process (GMAW).

Related Components: Base metals.

Materials: Electrode wire, gases.

Tools and Equipment: Gas metal arc welding equipment (semi-automated and mechanized), power sources, flow meters, regulators, guns, liners, drive rolls, cooling systems, contact tips, nozzles, gas diffusers.

Sub-task

24.01 Selects gas metal arc welding equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

24.01.01	knowledge of fundamentals of gas metal arc welding process (GMAW)
24.01.02	knowledge of semi-automated gas metal arc welding equipment
24.01.03	knowledge of mechanized gas metal arc welding equipment
24.01.04	knowledge of quality of end product

Supporting Knowledge & Abilities

24.01.05	knowledge of cooling systems
24.01.06	knowledge of direct current
24.01.07	knowledge of polarity
24.01.08	knowledge of duty cycle
24.01.09	knowledge of power sources
24.01.10	knowledge of base metal thickness
24.01.11	knowledge of cable size and length
24.01.12	knowledge of guns
24.01.13	knowledge of drive rolls
24.01.14	knowledge of contact tips
24.01.15	knowledge of nozzles
24.01.16	knowledge of gas diffusers
24.01.17	knowledge of flowmeters
24.01.18	knowledge of regulators
24.01.19	knowledge of liners
24.01.20	ability to detect damaged welding equipment
24.01.21	ability to detect welding equipment malfunctions

Sub-task

24.02 Selects gases.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

24.02.01	knowledge of type of base metal and thickness
24.02.02	knowledge of types of gases
24.02.03	knowledge of gas characteristics
24.02.04	ability to match gases to application

Sub-task

24.03 Selects consumables. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

24.03.01	knowledge of metallurgy
24.03.02	knowledge of characteristics of electrode wires
24.03.03	knowledge of characteristics of base metal
24.03.04	knowledge of characteristics of shielding gases
24.03.05	knowledge of manufacturers' specifications
24.03.06	knowledge of wire handling procedures
24.03.07	knowledge of wire storage requirements
24.03.08	ability to detect damage or defects in consumables

Sub-task

24.04 Selects operating parameters. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

24.04.01	knowledge of direct current
24.04.02	knowledge of polarity
24.04.03	knowledge of current characteristics
24.04.04	knowledge of amperage characteristics
24.04.05	knowledge of wire feed speed (current)
24.04.06	knowledge of metal transfer modes
24.04.07	knowledge of gas flow rates
24.04.08	knowledge of pulsing techniques
24.04.09	knowledge of wire stick out

Supporting Knowledge & Abilities

24.04.10 ability to follow manufacturers' recommendations

24.04.11 ability to make required adjustments

Sub-task

24.05 Sets up gas metal arc welding equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

24.05.01 knowledge of manufacturers' recommendations

24.05.02 knowledge of welding cables

24.05.03 knowledge of gas cylinder safety

24.05.04 knowledge of troubleshooting techniques

24.05.05 knowledge of set-up procedures for selected gas metal arc welding equipment

24.05.06 ability to hook up cables to proper polarity

24.05.07 ability to check cables and connections

24.05.08 ability to check equipment for leaks

Sub-task

24.06 Operates gas metal arc welding equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

24.06.01 knowledge of required task-specific personal protective clothing and equipment

24.06.02 knowledge of ventilation requirements

24.06.03 knowledge of shutdown procedures for selected gas metal arc welding equipment

Supporting Knowledge & Abilities

24.06.04	knowledge of equipment maintenance requirements
24.06.05	knowledge of welding techniques
24.06.06	knowledge of characteristics of electrodes during welding process
24.06.07	knowledge of pulsing techniques
24.06.08	ability to manipulate electrodes
24.06.09	ability to manipulate guns
24.06.10	ability to remove spatter
24.06.11	ability to detect flaws
24.06.12	ability to make adjustments to pulsing techniques
24.06.13	ability to maintain equipment
24.06.14	ability to apply appropriate welding techniques

Task 25 Welds using gas tungsten arc welding process (GTAW).

Related Components: Base metals.

Materials: Tungsten electrodes, filler rods, gas.

Tools and Equipment: Gas tungsten arc welding equipment (manual, automated and mechanized), power sources, gas tungsten arc welding process (GTAW) torch, cooling systems, feeders, remote controls, hoses, regulators, flow meters.

Sub-task

25.01 Selects gas tungsten arc welding equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

25.01.01	knowledge of fundamentals of gas tungsten metal arc welding process (GTAW)

Supporting Knowledge & Abilities

25.01.02	knowledge of quality of end product
25.01.03	knowledge of manual gas tungsten arc welding equipment
25.01.04	knowledge of automated gas tungsten arc welding equipment
25.01.05	knowledge of mechanized gas tungsten arc welding equipment
25.01.06	knowledge of power sources
25.01.07	knowledge of duty cycle
25.01.08	knowledge of remote accessories
25.01.09	knowledge of cooling systems
25.01.10	knowledge of high frequency current
25.01.11	knowledge of direct current
25.01.12	knowledge of polarities
25.01.13	knowledge of alternating current
25.01.14	knowledge of amperage
25.01.15	knowledge of regulators
25.01.16	knowledge of flowmeters
25.01.17	knowledge of base metal thickness
25.01.18	knowledge of torches
25.01.19	knowledge of torch accessories and components
25.01.20	ability to match equipment to application

Sub-task

25.02 Selects gases. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

25.02.01	knowledge of type of base metal and thickness
25.02.02	knowledge of types of gases
25.02.03	knowledge of gas characteristics
25.02.04	ability to match gases to application

Sub-task

25.03 Selects consumables. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

25.03.01	knowledge of gases
25.03.02	knowledge of filler rods
25.03.03	knowledge of tungsten electrodes
25.03.04	knowledge of base metals
25.03.05	knowledge of purging techniques
25.03.06	knowledge of shielding techniques
25.03.07	ability to detect damage or defects in consumables

Sub-task

25.04 Selects operating parameters. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

25.04.01	knowledge of AC/DC current
25.04.02	knowledge of characteristics of high frequency current
25.04.03	knowledge of voltage

Supporting Knowledge & Abilities

25.04.04	knowledge of amperage
25.04.05	knowledge of travel speed
25.04.06	knowledge of gas flow rates
25.04.07	knowledge of purging requirements
25.04.08	knowledge of purging techniques
25.04.09	ability to purge equipment
25.04.10	ability to follow manufacturers' recommendations

Sub-task

25.05 Sets up gas tungsten arc welding equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

25.05.01	knowledge of manufacturers' recommendations
25.05.02	knowledge of scope of work
25.05.03	knowledge of required task-specific personal protective clothing and equipment
25.05.04	knowledge of gas cylinder safety
25.05.05	knowledge of cooling systems
25.05.06	knowledge of remote controls
25.05.07	knowledge of units of high frequency
25.05.08	ability to verify gas flow rates
25.05.09	ability to follow set-up procedures

Sub-task

25.06 Operates gas tungsten arc welding equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	yes	NV

25.06.01	knowledge of pulsing techniques
25.06.02	knowledge of welding techniques
25.06.03	knowledge of up slope/down slope options
25.06.04	knowledge of shutdown procedures
25.06.05	knowledge of safety issues related to displacement of breathing air by shielding gases
25.06.06	ability to make adjustments to pulsing techniques
25.06.07	ability to detect flaws in weld
25.06.08	ability to detect equipment malfunctions
25.06.09	ability to apply appropriate welding techniques

Task 26 Welds using submerged arc welding process (SAW).

Related Components: Base metals.

Materials: Flux/wires.

Tools and Equipment: Submerged arc welding equipment (semi-automated and automated), power sources, cables, torch heads, wire spools, flux hoppers, flux recovery systems.

Sub-task

26.01 Selects submerged arc welding equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	no	yes	yes	yes	yes	yes	yes	yes	NV	no	NV

26.01.01	knowledge of fundamentals of submerged arc welding process (SAW)
26.01.02	knowledge of quality of end product
26.01.03	knowledge of semi-automated submerged arc welding equipment
26.01.04	knowledge of automated submerged arc welding equipment
26.01.05	knowledge of power sources
26.01.06	knowledge of cooling systems
26.01.07	knowledge of direct current
26.01.08	knowledge of alternating current
26.01.09	knowledge of polarity
26.01.10	knowledge of duty cycle
26.01.11	knowledge of base metal thickness
26.01.12	knowledge of cable sizes
26.01.13	knowledge of wire feeders
26.01.14	knowledge of guns
26.01.15	knowledge of drive rolls
26.01.16	knowledge of contact tips
26.01.17	knowledge of nozzles
26.01.18	knowledge of flux hoppers
26.01.19	ability to match equipment to application

Sub-task

26.02 Selects consumables. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	no	yes	yes	yes	yes	yes	yes	yes	NV	no	NV

26.02.01	knowledge of electrode wires/fluxes
26.02.02	knowledge of flux recovery systems
26.02.03	knowledge of storage requirements for flux and electrode wires
26.02.04	knowledge of handling of fluxes and electrode wires
26.02.05	ability to match consumables to welding process

Sub-task

26.03 Selects operating parameters. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	no	yes	yes	yes	yes	yes	yes	yes	NV	no	NV

26.03.01	knowledge of direct current
26.03.02	knowledge of polarity
26.03.03	knowledge of alternating current
26.03.04	knowledge of wire feed speed (current)
26.03.05	knowledge of wire stick out
26.03.06	knowledge of current characteristics
26.03.07	knowledge of voltage characteristics
26.03.08	ability to follow manufacturers' recommendations
26.03.09	ability to make required adjustments

Sub-task

26.04 Sets up submerged arc welding equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	no	yes	yes	yes	yes	yes	yes	yes	NV	no	NV

26.04.01	knowledge of welding cable sizes
26.04.02	knowledge of manufacturers' recommendations
26.04.03	knowledge of troubleshooting techniques
26.04.04	knowledge of set-up procedures
26.04.05	ability to hook up cables to proper polarity
26.04.06	ability to check cables and connections

Sub-task

26.05 Operates submerged arc welding equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	no	yes	yes	yes	yes	yes	yes	yes	NV	no	NV

26.05.01	knowledge of required task-specific personal protective clothing and equipment
26.05.02	knowledge of ventilation requirements
26.05.03	knowledge of equipment maintenance requirements
26.05.04	knowledge of equipment shutdown procedures
26.05.05	knowledge of welding techniques
26.05.06	knowledge of characteristics of electrodes and fluxes during welding process
26.05.07	ability to manipulate guns
26.05.08	ability to detect flaws

Supporting Knowledge & Abilities

26.05.09	ability to remove slag
26.05.10	ability to remove spatter
26.05.11	ability to maintain equipment
26.05.12	ability to apply appropriate welding techniques

Task 27 Joins using stud arc welding process (SW).

Related Components: Base metals.

Materials: Ferrules, studs.

Tools and Equipment: Power sources, electrode holders complete with pressure apparatus.

Sub-task

27.01 Selects stud arc welding equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	no	NV

27.01.01	knowledge of fundamentals of stud arc welding process (SW)
27.01.02	knowledge of power sources
27.01.03	knowledge of stud arc welding equipment
27.01.04	knowledge of stud arc welding components
27.01.05	knowledge of base metal thickness
27.01.06	knowledge of stud to gun connection sizes and shapes
27.01.07	ability to match equipment to application

Sub-task

27.02 Selects consumables. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	no	NV

27.02.01	knowledge of types of studs and stud to gun connections
27.02.02	knowledge of stud and stud to gun connection sizes
27.02.03	knowledge of stud and stud to gun connection shapes
27.02.04	knowledge of types of fastening devices
27.02.05	knowledge of types of ferrules
27.02.06	knowledge of ferrule sizes
27.02.07	ability to match consumables to welding process

Sub-task

27.03 Selects operating parameters. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	no	NV

27.03.01	knowledge of manufacturers' specifications
27.03.02	knowledge of lift
27.03.03	knowledge of plunge time
27.03.04	knowledge of AC/DC current
27.03.05	knowledge of voltage/amperage

Sub-task

27.04 Sets up stud arc welding equipment. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	no	NV

27.04.01 knowledge of manufacturers' specifications

27.04.02 knowledge of welding equipment set-up procedures

27.04.03 ability to test welding equipment set-up

Sub-task

27.05 Operates stud arc welding equipment. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	NV	no	NV

27.05.01 knowledge of shutdown procedures

27.05.02 knowledge of proper set-up

27.05.03 ability to identify defects in work

27.05.04 ability to detect equipment malfunctions

27.05.05 ability to level and square gun to material

27.05.06 ability to apply appropriate welding techniques

Task 28 Joins using resistance welding process (RW) (RSW – Spot and Seam).

Related Components: Base metals.

Materials: Not applicable.

Tools and Equipment: Power sources, electrode tips and wheels, electrode holders complete with pressure apparatus.

Sub-task

28.01 Selects resistance welding equipment. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	no	yes	no	yes	yes	NV	yes	NV

28.01.01	knowledge of fundamentals of resistance welding process
28.01.02	knowledge of characteristics of power sources
28.01.03	knowledge of cooling systems
28.01.04	knowledge of characteristics of electrode tips
28.01.05	knowledge of characteristics of electrode wheels
28.01.06	knowledge of resistance welding equipment
28.01.07	knowledge of type and thickness of base metal
28.01.08	knowledge of duty cycle
28.01.09	knowledge of accessibility
28.01.10	ability to match welding equipment to application

Sub-task

28.02 Selects operating parameters. **Supporting Knowledge & Abilities**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	no	yes	no	yes	yes	NV	yes	NV

28.02.01	knowledge of type and thickness of base metal
28.02.02	knowledge of condition of base metal
28.02.03	knowledge of current
28.02.04	knowledge of voltage
28.02.05	knowledge of time (Spot)
28.02.06	knowledge of travel speed (Seam)

Supporting Knowledge & Abilities

28.02.07	knowledge of electrode tip pressure
28.02.08	knowledge of wheel pressure
28.02.09	knowledge of metallurgy
28.02.10	knowledge of weld cycle
28.02.11	ability to source information
28.02.12	ability to determine welding cycle and appropriate parameters

Sub-task

28.03 Sets up resistance welding equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	no	yes	no	yes	yes	NV	yes	NV

28.03.01	knowledge of current
28.03.02	knowledge of time and pressure
28.03.03	knowledge of cooling systems
28.03.04	ability to install and adjust electrodes
28.03.05	ability to adjust current
28.03.06	ability to adjust weld time
28.03.07	ability to adjust pressure
28.03.08	ability to test welding equipment set-up

Sub-task

28.04 Operates resistance welding equipment.

Supporting Knowledge & Abilities

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU
yes	yes	yes	yes	yes	no	yes	no	yes	yes	NV	yes	NV

28.04.01	knowledge of manufacturers' recommendations

Supporting Knowledge & Abilities

28.04.02	knowledge of shutdown procedures
28.04.03	ability to check set-up
28.04.04	ability to identify defects
28.04.05	ability to apply appropriate welding techniques

APPENDICES

TOOLS AND EQUIPMENT

Welders may supply their own boots, coveralls, and gloves. Items such as hard hats, eye, ear, and lung protection, and all other tools and equipment are frequently the responsibility of the employer. Resource materials, charts, regulations, specifications, service bulletins, manufacturers' manuals, and log (record) books are supplied by the employer or equipment owner.

Basic Hand Tools and Equipment

adjustable wrenches (various sizes)
Allen wrenches (metric and imperial)
ammeter
bench vice
broom
brushes (various bristle brushes for cleaning and scrubbing)
"C" clamps (various sizes)
chain hoists
chalk line
chokers
cold chisels (various sizes)
combination wrenches (metric and imperial)
come-alongs
cylinder carts
cylinder cradles
dollies
electric cords
files (flat, half-round, rat-tail, bastard)
flashlight
friction lighter
funnels
hack saw
hammers (chipping, ball peen, claw, sledge, various sizes)
hand shears
jacks
knives
ladders
magnets
metals markers
mop
oil can
pails (plastic and metal)
paint brushes
pipe cutter
pipe wrenches
pliers (needle nose, slip joint)
positioners
pry bars
punches
rollers
scaffolding (safety)
scrapers (various sizes)
screwdrivers (flat, Phillips, Robertson, various sizes)
shovels (flat mouth)
slings
snips (heavy duty sheet metal cutting)
soapstone markers
socket sets (metric and imperial)
soldering iron
stamping tools
temperature sticks
tip cleaners
tool boxes
vice grips
vices (chain vice, pipe vice)
water hose
wire brush
wire cutter
wrench sets (open and closed ends, both metric and imperial)

Measuring Tools

calculator
callipers
depth gauge
feeler gauges
fillet gauges
laser level
torpedo level
micrometer
plumb bob
scribers
spirit level
squares
stop watch
straight edges
tape measure
tri squares
vernier callipers
welding gauges

Testing Equipment

adapter fittings
ammeter
calibrating gauges
pressure difference gauges
pressure gauge kit
temperature gauges
temperature sticks

Power Tools and Equipment

air hose and nozzle
air monitoring device
arc welder
oxy-fuel cutting equipment
band saw
buffers
chop saw (cut-off saw)
circular saw
coil heating equipment
compressors
cranes (overhead, gantry-type, monorail, boom)
drills (portable, magnetic base, drill press)
electric drills
electronic measuring device (hand-held "electronic tape measure" type)
feeders – wire
fork lifts
gas detector
grinders (wire brush, angle grinders)
guns – welding
hammer drill
hand-held and stationary radios
headphones
heated hoppers
heaters (electric, natural gas, oil, propane)
heating torch
hydraulic press brake
hydraulic shear
hydrostatic equipment
impact wrenches (electric or pneumatic)
nibblers
ovens
oxyacetylene brazing torch
oxyacetylene cutting torch
pipe-bevelling machine
pipe cutters
plasma console
pneumatic equipment
power hack saw
power vice
propane torch
reamer (hand held or mounted on power threader)
reciprocating saw
routers
sand-blast equipment
sanders
scissor lift
testing pump
torches
vacuum (wet/dry)
winches
wire wheel (body grinder or angle grinder with wire brush)

Hoisting and Lifting Equipment

cable clamps
chain block hoist
chains
chokers
come-alongs (cable or chain)
connectors
forklift
overhead hoist
portable boom
rope
slings
spreader bars
stands
supports
tuggers

Safety Equipment

air hoods
aprons
body harness
boots
coveralls
ear-plugs and muffs
face shields
fire blankets
fire extinguishers
fire hoses
gloves
goggles
masks (particle, vapour)
respirators
safety glasses
safety helmet
welding shield

Resource Material

code books
drawings
engineering specifications
job schedules
manufacturers' specifications, manuals, and charts
Material Safety Data Sheets
packing slips
pamphlets
prints
regulatory information
safety manuals
service bulletins
shop manuals
specifications
weigh bills
written informational or instructional material

GLOSSARY

Terms having a significant meaning for this analysis were operationally defined and are as follows:

air maintenance devices — equipment used to maintain system air pressure (pressure regulator, compressor).

ammeter — meter used to measure amperage within an electrical circuit.

arc welding — includes air arc, SMAW (Shielded Metal Arc Welding).

ASME — American Society of Mechanical Engineers.

AWS — American Welding Society.

back-stepping — beginning a weld in the field of a joint and progressing towards the edge of the material.

backfire burnback — condition in which torch flame rapidly burns back into the torch tip making a pronounced popping sound and causing the gases to rapidly re-ignite. Upon re-ignition, the flame re-appears at the end of the torch tip to burn back again into the torch tip. Usually caused by excessively dirty torch tip or low gas pressures.

blanks — or pipe blanks—used to seal or cap off the ends of pipes.

carbon arc welding (CAW) — a type of welding, now almost totally obsolete, which used flux-coated electrodes and grounding clamps.

CGA — Compressed Gas Association.

chalk line — a string coated with chalk used to snap straight chalk lines for the laying out of steel plates.

choker — a type of cable with loops on both ends that is used for rigging and lifting materials and equipment.

consumable guides — certain types of equipment require guides which assist in feeding material to the operation at hand and which are consumed in the process.

consumables — filler wire, electrodes, flux, gases, or other materials that are consumed in the course of welding and cutting operations.

CSA — Canadian Standards Association.

CWB	Canadian Welding Bureau.
deposition	the amount or rate of material placed by a welding operation.
drive rolls	in wire feed equipment that come in various sizes to drive wire through liner to gun contact tip.
electrodes	metal filler rods of varying lengths and thicknesses which may be coated with flux or other materials to aid in welding or cutting operations.
FCAW	Flux Core Arc Welding.
female/male connector	connectors used at the end of welding cables or torch hoses to connect cables or hoses together.
filler wire	material to be melted during the welding process which comes supplied in a continuous roll rather than as a rod or electrode.
fillet gauge	inspection tool used to measure fillet leg size or the effective throat of a fillet.
flash-arrester check-valve	a combination device that reduces the possibility of flash-back.
flash-back arrester	a type of equipment that prevents possible explosions due to ignition of gases in the hoses of oxy-fuel or air/fuel equipment.
flow meter	meter used in conjunction with a regulator to measure the volume of gases used in welding processes.
flux	chemical preparations which assist in the deposition of materials during operations such as brazing and soldering.
friction lighter	a tool used to ignite the gases at the tip of a welding or cutting torch.
gas diffusers	in Gas Tungsten Arc Welding, a collet body holder that diffuses the gas and grips the tungsten.
GMAW	Gas Metal Arc Welding.
ground clamp	clamp fastened to the end of a welding cable lead that is then fastened onto a workpiece to allow for a completed welding circuit.
GTAW	Gas Tungsten Arc Welding.
guns	the part of certain types of welding equipment that is actually held in the hand and is used to control the filler wire or rod.

hard surfacing	also known as hard facing—applying a hard filler metal to a softer base metal for wear resistance.
heated hoppers	hoppers that are maintained at a certain temperature in order to produce the best results from the materials that they contain (such as flux).
heat-treating	any application of heat to metal assemblies for the purpose of bending, stress relieving, preheating, hardening, or tempering.
high-low gauge	inspection device used to measure the alignment or misalignment of steel surfaces.
intermittent welding	short welds spaced out along a joint.
inverted power sources	inverters are designed to operate on a high cycle in order to provide high amperage in a smaller unit.
magnesium ribbon	a flammable metal strip used to ignite thermit welding compounds.
magnetic particle test	a test involving magnets and iron filings to determine the existence of defects or cracks in welds.
metallurgy	more accurately—welding metallurgy—the technique or study of working, joining, or heat-treating metals and alloys.
NFPA	National Fire Protection Association.
nozzle	ceramic or metal cup located at the end of a welding gun or torch in which gases flow through before travelling to work surface.
OHS	Occupational Health and Safety.
ovens	ovens that are maintained at a certain temperature in order to produce the best results from the materials that they contain (such as electrodes).
pipe angle marker	device with a level for finding or setting angles on pipe.
plasma console	the console used to control the equipment during plasma arc welding.
plumb bob	precision machined weight tied to the end of a string used for aligning points of different elevations and setting work pieces in proper alignment.
portable rod oven	small oven designed to be used on field jobs and site projects to heat welding rods.
postheating	heating assemblies after final welds are complete in order to remove stresses, often involving wrapping the assembly in fire-retardant materials to allow even distribution of heat.

preheating heating metals to a desired temperature to aid in the welding process. Normally seen on thick plate sections, alloy metals and cold steels. Generally to a temperature approved by a code or engineer within a QA system.

Pressure Vessels Act a Canadian act that dictates the construction and minimum requirements of vessels under pressure.

puddle the pool or puddle of molten material that actually forms the bond between pieces that are being welded.

purge gas a neutral gas used to force other potentially explosive gases from an assembly before welding commences.

reaming a process in the joining of pipe to restore the pipe to its original inside diameter, usually by removing the internal burr formed by cutting the pipe.

regulator a piece of equipment that regulates the flow and/or pressure of gases through a hose.

resistance welding a type of welding that requires the passage of current through the material (usually when bonding sheet materials) at a precise location and which depends on the melting together of the two pieces at that point.

shield gas the gas used to surround a welding operation and to protect it from the atmosphere.

skip-welding placing short welds along a joint in no particular sequence.

slag impure or vitrified material produced during some welding operations.

sling any metal or synthetic flexible device used to cradle or support a load; slings are attached to the hoist line of the lifting device to complete the lift.

soapstone either a flat or round marker made of soft soapstone that is used to temporarily mark steel for layout work.

spray welding oxy-fuel or plasma spray involving spraying a filler material onto a rough surface for purposes of build-up.

squeeze time the amount of time the electrodes welder are activated over the point of the weld.

staggered burning often done with an automatic burning machine, this technique.

staggered welding placing short welds along a joint while leaving spaces between welds.

stick-out	the amount of filler wire, tungsten, or other material protruding from the gun or welding head of the equipment.
temperature stick	indicating crayon which melts at a certain temperature.
thermit mould	the mould used to contain the molten materials and to give the desired finished shape to a thermit weld.
transformer rectifiers	a type of welding power source that brings in AC power and rectifies it to DC through the use of a diode.
voltage meter	meter used to measure voltage within an electrical circuit.
welding tip	tip found at the end of a welding gun in which electricity is transferred from the gun to the consumable wire before the wire enters the weld zone.
WHMIS	Workplace Hazardous Materials Information System.
yoke	a U-shaped piece of equipment used to perform magnetic particle tests on welded assemblies.

BLOCKS AND TASKS WEIGHTING

BLOCK A OCCUPATIONAL SKILLS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	National Average
%	14	20	20	25	20	25	25	23	10	20	NV	25	NV	21%

Task 1 Interprets blueprints and drawings.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	18	10	20	16	20	15	20	18	15	18	NV	30	NV	17%

Task 2 Identifies materials.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	8	9	5	5	5	5	5	6	20	10	NV	2	NV	8%

Task 3 Sources required information.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	5	10	10	7	15	5	5	8	7	9	NV	2	NV	7%

Task 4 Prepares work area.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	6	10	10	7	10	10	10	10	8	6	NV	10	NV	9%

Task 5 Lays out materials.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	18	9	15	15	5	12	10	18	15	12	NV	20	NV	14%

Task 6 Prepares materials.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	12	18	10	15	10	13	10	8	5	11	NV	10	NV	11%

Task 7 Fabricates components.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	21	12	20	20	15	20	15	16	20	15	NV	20	NV	18%

Task 8 Maintains equipment.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	6	8	5	5	10	10	10	7	5	9	NV	2	NV	7%

Task 9 Performs basic rigging operations.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	6	14	5	10	10	10	15	9	5	10	NV	4	NV	9%

BLOCK B QUALITY CONTROL

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	National Average
%	7	5	15	10	20	10	15	15	6	20	NV	5	NV	12%

Task 10 Complies with codes, specifications and standards.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	40	60	60	30	35	60	30	45	60	50	NV	50	NV	47%

Task 11 Verifies materials.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	20	30	10	30	30	15	35	25	25	10	NV	25	NV	23%

Task 12 Performs inspections.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	40	10	30	40	35	25	35	30	15	40	NV	25	NV	30%

BLOCK C CUTTING PROCESSES

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	National Average
%	17	25	20	10	20	12	20	19	18	10	NV	15	NV	17%

Task 13 Cuts with mechanical and power tools.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	18	30	40	20	25	25	25	17	30	20	NV	30	NV	25%

Task 14 Cuts using oxy-fuel gas cutting process (OFC).

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	44	25	40	40	35	35	30	33	30	40	NV	30	NV	35%

Task 15 Cuts using plasma arc cutting process (PAC).

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	19	15	10	30	35	25	25	26	30	20	NV	30	NV	24%

Task 16 Cuts using air carbon arc cutting process (ACA).

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	14	20	5	10	5	10	20	14	5	15	NV	5	NV	11%

Task 17 Cuts using electric arc cutting process (AC).

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	5	10	5	0	0	15	0	10	5	5	NV	5	NV	5%

BLOCK D GOUGING PROCESSES

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	National Average
%	11	10	5	5	20	3	15	10	6	15	NV	10	NV	10%

Task 18 Gouges using air carbon arc cutting process (ACA).

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	61	50	90	45	50	85	50	43	60	45	NV	50	NV	57%

Task 19 Gouges using plasma arc cutting process (PAC).

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	19	20	0	55	30	15	35	36	30	45	NV	35	NV	29%

Task 20 Gouges using oxy-fuel gas cutting process (OFC).

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	20	30	10	0	20	0	15	21	10	10	NV	15	NV	14%

BLOCK E WELDING PROCESSES

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	National Average
%	51	40	40	50	20	50	25	33	60	35	NV	45	NV	40%

Task 21 Welds using oxy-fuel welding process (OFW).

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	7	12	4	0	5	0	5	8	5	5	NV	10	NV	6%

Task 22 Welds using shielded metal arc welding process (SMAW).

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	26	20	30	40	15	40	20	27	26	20	NV	20	NV	26%

Task 23 Welds using flux cored arc welding process (FCAW).

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	20	18	20	15	20	15	15	14	25	15	NV	20	NV	18%

Task 24 Welds using gas metal arc welding process (GMAW).

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	14	16	20	15	20	19	20	17	20	20	NV	20	NV	18%

Task 25 Welds using gas tungsten arc welding process (GTAW).

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	19	14	15	24	20	20	20	15	15	15	NV	10	NV	17%

Task 26 Welds using submerged arc welding process (SAW).

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	7	10	3	2	10	3	10	12	5	15	NV	10	NV	8%

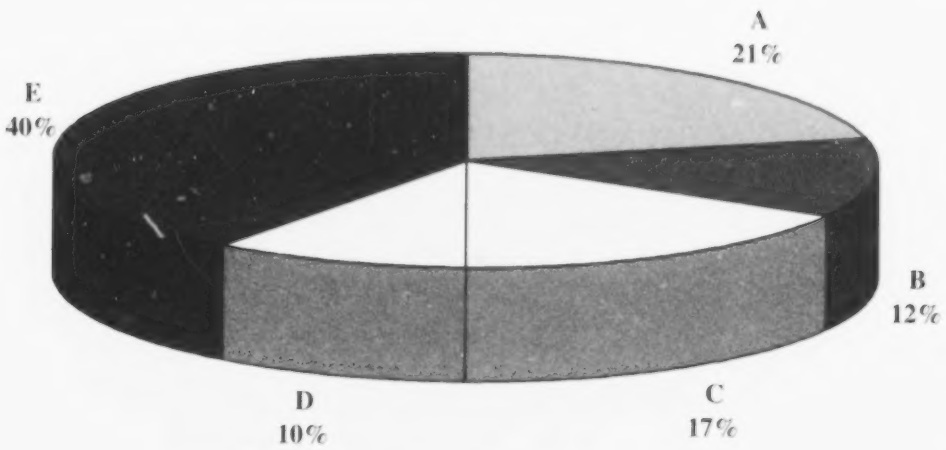
Task 27 Joins using stud arc welding process (SW).

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	4	4	4	2	5	3	5	7	2	5	NV	5	NV	4%

Task 28 Joins using resistance welding process (RW) (RSW – Spot and Seam).

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YK	NU	
%	3	6	4	2	5	0	5	0	2	5	NV	5	NV	3%

PIE CHART*
Welder



TITLES OF BLOCKS

Block A	Occupational Skills	Block D	Gouging Processes
Block B	Quality Control	Block E	Welding Processes
Block C	Cutting Processes		

* Average percentage of the total number of questions on an interprovincial examination, assigned to assess each block of the analysis, as derived from the collective input from workers within the occupation from all areas of Canada. Interprovincial examinations typically have from 100 up to 150 multiple-choice questions on each examination.

WELDER (2004)

BLOCKS	TASKS	SUB-TASKS			
Occupational Skills	1. Interprets blueprints and drawings.	1.01 Determines required materials.	1.02 Identifies work processes.	1.03 Identifies dimensions and details.	1.04 Sketches details.
	2. Identifies materials.	2.01 Performs basic tests on materials.	2.02 Reviews documentation and markings.		
	3. Sources required information.	3.01 Interprets information related to operation of equipment.	3.02 Interprets information related to materials.	3.03 Identifies applicable specifications, codes and standards.	
	4. Prepares work area.	4.01 Cleans work area.	4.02 Plans sequence of operation.	4.03 Gathers work materials and equipment.	
	5. Lays out materials.	5.01 Develops templates.	5.02 Transfers dimensions from drawings to materials.	5.03 Confirms material dimensions.	
	6. Prepares materials.	6.01 Cuts material to specifications.	6.02 Grinds materials.	6.03 Cleans weld area.	
	7. Fabricates components.	7.01 Selects required process.	7.02 Assembles components.	7.03 Preheats weld area (weldments).	7.04 Tacks components.	7.05 Finishes final product.

BLOCKS		TASKS	SUB-TASKS						
		8. Maintains equipment.	8.01 Performs visual inspection of equipment.	8.02 Checks equipment for leaks.	8.03 Repairs leaks.	8.04 Checks protective devices operation and location.			
		9. Performs basic rigging operations.	9.01 Ties knots.	9.02 Selects rigging equipment.	9.03 Performs signals.	9.04 Operates basic lifting devices.			
B	**Quality Control**	**10.** Complies with codes, specifications and standards.	10.01 Complies with weld procedure specifications (WPS) and data sheets.	10.02 Ensures personal trade qualifications meet requirement.					
		11. Verifies materials.	11.01 Matches heat numbers against markings.	11.02 Verifies consumables conform to specifications.					
		12. Performs inspections.	12.01 Examines components (fit-up and preparation) prior to assembly.	12.02 Examines completed welds.	12.03 Measures completed welds.	12.04 Measures final product for compliance to blueprints and drawings.			
C	**Cutting Processes**	**13.** Cuts with mechanical and power tools.	13.01 Selects mechanical and power cutting equipment.	13.02 Selects operating parameters.	13.03 Sets up mechanical and power cutting equipment.	13.04 Operates mechanical and power cutting equipment.			
		14. Cuts using oxy-fuel gas cutting process (OFC).	14.01 Selects oxy-fuel cutting equipment.	14.02 Selects fuel gas.	14.03 Selects tips.	14.04 Selects operating parameters.	14.05 Sets up oxy-fuel cutting equipment.	14.06 Operates oxy-fuel cutting equipment.	14.07 Shuts down oxy-fuel cutting equipment.

WELDER (2004)

BLOCKS	TASKS	SUB-TASKS					
	15. Cuts using plasma arc cutting process (PAC).	15.01 Selects plasma arc cutting equipment.	15.02 Selects gases.	15.03 Selects consumables.	15.04 Selects operating parameters.	15.05 Sets up plasma arc cutting equipment.	15.06 Operates plasma arc cutting equipment.
	16. Cuts using air carbon arc cutting process (ACA).	16.01 Selects air carbon arc cutting equipment.	16.02 Selects consumables.	16.03 Selects operating parameters.	16.04 Sets up air carbon arc cutting equipment.	16.05 Operates air carbon arc cutting equipment.	
	17. Cuts using electric arc cutting process.	17.01 Selects electric arc cutting equipment.	17.02 Selects consumables.	17.03 Selects operating parameters.	17.04 Sets up electric arc cutting equipment.	17.05 Operates electric arc cutting equipment.	
D **Gouging Processes**	**18.** Gouges using air carbon arc cutting process (ACA).	18.01 Selects air carbon arc cutting equipment for gouging.	18.02 Selects consumables.	18.03 Selects operating parameters.	18.04 Sets up air carbon arc cuting equipment for gouging.	18.05 Operates air carbon arc cutting equipment for gouging.	
	19. Gouges using plasma arc cutting process (PAC).	19.01 Selects plasma arc cutting equipment for gouging.	19.02 Selects gases.	19.03 Selects consumables.	19.04 Selects operating parameters.	19.05 Sets up plasma arc cutting equipment for gouging.	19.06 Operates plasma arc cutting equipment for gouging.
	20. Gouges using oxy-fuel gas cutting process (OFC).	20.01 Selects oxy-fuel gas cutting equipment for gouging.	20.02 Selects fuel gas.	20.03 Selects tips.	20.04 Selects operating parameters.	20.05 Sets up oxy-fuel gas cutting equipment for gouging.	20.06 Operates oxy-fuel gas cutting equipment for gouging.	20.07 Shuts down oxy-fuel gas cutting equipment.
E **Welding Processes**	**21.** Welds using oxy-fuel gas welding process (OFW).	21.01 Selects oxy-fuel gas welding equipment.	21.02 Selects fuel gas.	21.03 Selects tips.	21.04 Selects consumables.	21.05 Selects operating parameters.	21.06 Sets up oxy-fuel gas welding equipment.	21.07 Operates oxy-fuel gas welding equipment.	21.08 Shuts down oxy-fuel gas welding equipment.

WELDER (2004)

BLOCKS	TASKS	SUB-TASKS					
	22. Welds using shielded metal arc welding process (SMAW).	22.01 Selects shielded metal arc welding equipment.	22.02 Selects consumables.	22.03 Selects operating parameters.	22.04 Sets up shielded metal arc welding equipment.	22.05 Operates shielded metal arc welding equipment.	
	23. Welds using flux cored arc welding process (FCAW).	23.01 Selects flux cored arc welding equipment.	23.02 Selects consumables.	23.03 Selects operating parameters.	23.04 Sets up flux cored arc welding equipment.	23.05 Operates flux cored arc welding equipment.	
	24. Welds using gas metal arc welding process (GMAW).	24.01 Selects gas metal arc welding equipment.	24.02 Selects gases.	24.03 Selects consumables.	24.04 Selects operating parameters.	24.05 Sets up gas metal arc welding equipment.	24.06 Operates gas metal arc welding equipment.
	25. Welds using gas tungsten arc welding process (GTAW).	25.01 Selects gas tungsten arc welding equipment.	25.02 Selects gases.	25.03 Selects consumables.	25.04 Selects operating parameters.	25.05 Sets up gas tungsten arc welding equipment.	25.06 Operates gas tungsten arc welding equipment.
	26. Welds using submerged arc welding process (SAW).	26.01 Selects submerged arc welding equipment.	26.02 Selects consumables.	26.03 Selects operating parameters.	26.04 Sets up submerged arc welding equipment.	26.05 Operates submerged arc welding equipment.	
	27. Joins using stud arc welding process (SW).	27.01 Selects stud arc welding equipment.	27.02 Selects consumables.	27.03 Selects operating parameters.	27.04 Sets up stud arc welding equipment.	27.05 Operates stud arc welding equipment.	
	28. Joins using resistance welding process (RW) (RSW – Spot and Seam).	28.01 Selects resistance welding equipment.	28.02 Selects operating parameters.	28.03 Sets up resistance welding equipment.	28.04 Operates resistance welding equipment.		